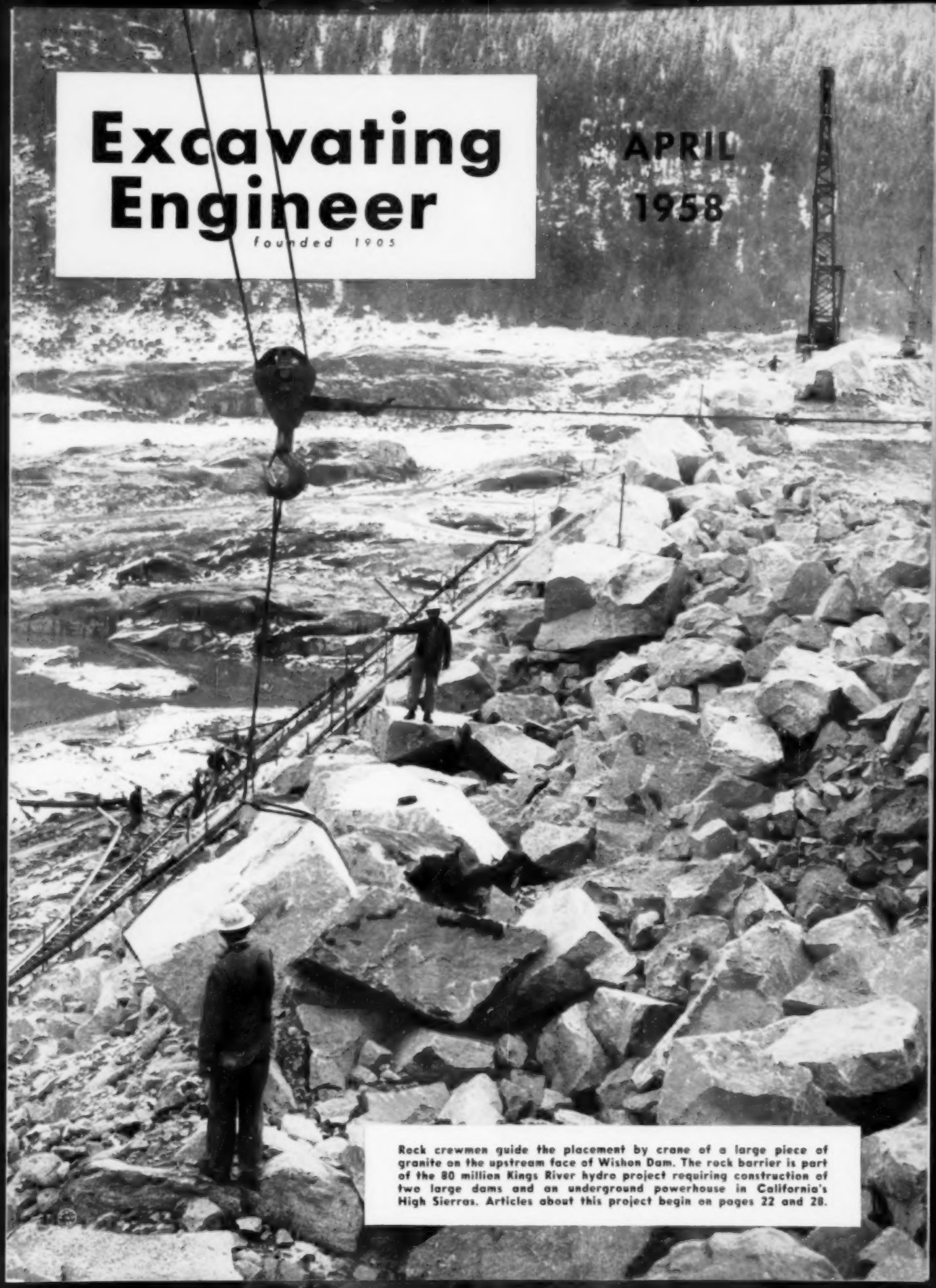
Excavating Engineer

founded 1905

APRIL

1958



Rock crewmen guide the placement by crane of a large piece of granite on the upstream face of Wishon Dam. The rock barrier is part of the 80 million Kings River hydro project requiring construction of two large dams and an underground powerhouse in California's High Sierras. Articles about this project begin on pages 22 and 28.

The 1650-B STANDS OUT
by every standard of comparison

Use any yardstick you wish to measure the worth of a stripping shovel — range, speed, ease of control, durability, low maintenance, or that all-important factor: steady, big-output performance. You'll find that the Bucyrus-Erie 1650-B stripping shovel is outstanding by every standard of comparison.

The 1650-B is available with 40 to 65-cu. yd. dippers, with dumping reach ranging from 178 to 135 feet. The machine illustrated here has a 55-cu. yd. dipper and a dumping radius of 147½ feet.

Big and rugged, the 1650-B is built in the finest Bucyrus-Erie tradition — backed by unequalled experience in building excavating machinery for use all over the world.

Check into the economical advantages of Bucyrus-Eries. A complete line of stripping shovels and walking draglines from 2½ to 65 cu. yd. capacities provides an excavator to fit any mining job. 130L57C

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

NEW RESULTS OF MONSANTO RESEARCH IN USE OF AMMONIUM NITRATE AS AN EXPLOSIVE

Typical shot with Monsanto's new kind of prilled NH_4NO_3

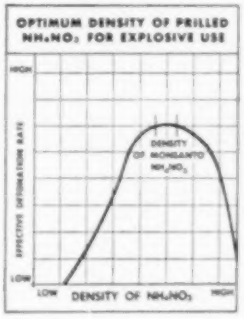
View of area involved in the blast. Shot was made in heavy columnar basalt at dam site. Used as an explosive: a new, top-quality, prilled NH_4NO_3 that Monsanto research developed to give you optimum savings, safety, speed and ease of handling.

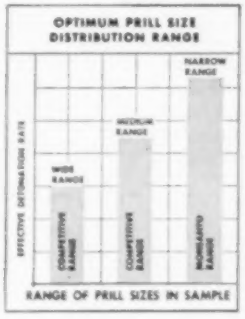
View at time of detonation. The system of detonation recommended by Monsanto, in conjunction with Monsanto Ammonium Nitrate, will yield equivalent pound-for-pound results with 60% gelatin dynamite at one-fourth the cost.

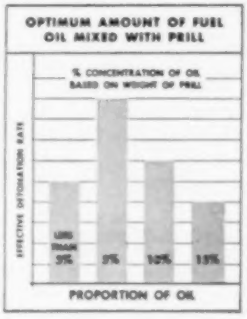
Results of blast. The powder factor in the shot above was 0.4 lbs. per cubic yard. Breakage of rock was considered ideal by contractor. Monsanto's experienced staff can give you complete technical service. Just phone Monsanto.

Photos courtesy of MORRISON-KNUDSEN COMPANY, INC.

Monsanto Ammonium Nitrate is now produced according to the specifications determined by these findings of Monsanto research. Result: more effective blast at greater savings. Monsanto is the world's largest manufacturer of prilled ammonium nitrate—and leader in developing the use of NH_4NO_3 as an explosive for open work. Request report presenting latest research findings.







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OR WIRE NOW FOR COMPLETE INFORMATION

MONSANTO CHEMICAL COMPANY
Inorganic Chemicals Division
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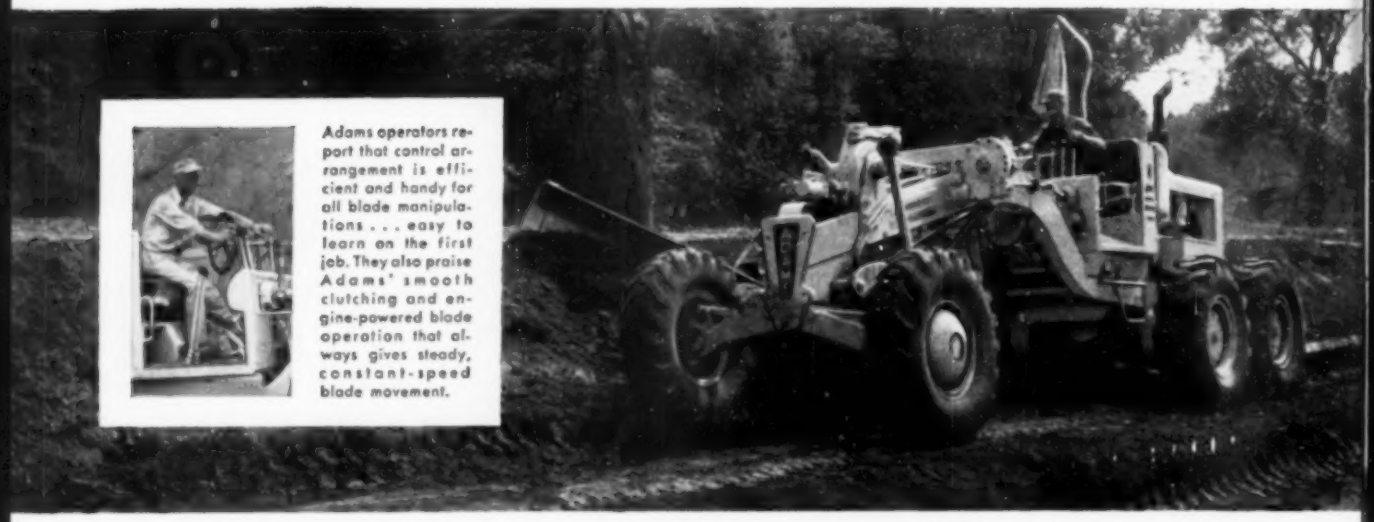
In Canada: Monsanto Canada Ltd., Montreal

Monsanto®

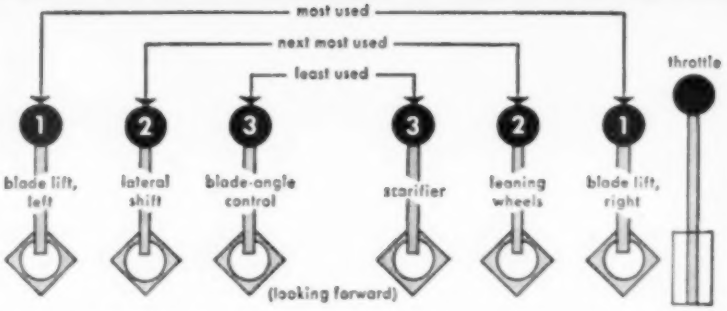
Where Creative Chemistry Works Wonders For You

HOW handy-reach power-controls boost grader output

Adams operators report that control arrangement is efficient and handy for all blade manipulations . . . easy to learn on the first job. They also praise Adams' smooth clutching and engine-powered blade operation that always gives steady, constant-speed blade movement.



Adams* grader controls arranged for most efficient hand movement – cut non-productive blade-swing time – permit faster grading speeds



This handy-reach arrangement was developed after careful, scientific study of control lever usage, on contractor and county government type of work. Automatic counters were placed on control levers of machines doing typical, everyday grading. Each time the operator pushed or pulled a control, it was recorded and counted. The statistics thus gathered, guided engineers in determining the optimum location for Adams controls. Result? . . . the fast-operating control arrangement shown.

You'll reduce wasted dead-stop time, speed-up grader operations, when you add Adams graders to your fleet. Working with Adams' efficiently arranged power-box controls, operators can easily complete more grading . . . get more road work done each day. Here's why:

Most-used controls are handiest

Adams controls are conveniently mounted in a row, with most-used levers at the ends — left and right — where your operator can quickly put his hands on them (see sketch). Next most-used controls are in the 2nd positions . . . easy to grasp without looking. Functions of No. 1 and 2 levers are so arranged that your operators can often work 2 at a time with the same hand. Thus he can frequently operate 4 levers with 2 hands . . . reducing length and number of manual movements.

Saves time on ditch-work

When you clean or build ditches, Adams controls save time. Your operator makes lateral and vertical adjustments of the moldboard in one continuous, smooth action . . . to ditch cut . . . to bank cut . . . to casting position . . . to spreading position.

Left blade-lift and lateral-shift levers are adjacent, for easy, one-hand operation of both levers *simultaneously*. This helps operator swing blade from deep ditch to high bank position (or reverse) in much less than a minute. It saves awkward reaching to operate 2 levers . . . first one, then the other.

Better control on high-speed cuts

With lateral-shift lever in No. 2 left position, Adams operator has accurate blade control — left and right. He needn't keep reaching way behind the wheel. Thus, your operator can work faster . . . maneuver closer to obstructions . . . do a better job where frequent blade changes are necessary.

Call or write for a demonstration. See how easy-reach controls — plus many other cost-cutting features — make Adams *your* best buy. 6 models, 60 to 190 hp. Choice of General Motors or Cummins engines on 5 larger Adams models.

*Trademark G-1318-G-1

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Where quality is a habit

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Excavating Engineer

founded 1905

South Milwaukee, Wisconsin

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Successful bidder on 19 earth-fill dams

"Our Allis-Chalmers equipment has proved it can move more dirt at low cost . . . and let us be low bidder time after time. It gets a full share of credit for our success," says **Joe Duncan** of Arnett & Duncan, Corsicana, Texas.

TS-360 motor scrapers (15 yd struck; 20 yd heaped), like that shown at the left, are the big guns of the Arnett & Duncan fleet on earth-fill dam construction. Working with the TS-260's (11 yd struck; 14 yd heaped), they help make a high-production, low cost-per-yard team.

7,000 cu yd per day

. . . that's the kind of earth-moving production Arnett & Duncan get from their spread of Allis-Chalmers motor scrapers and crawler tractors.

Working on 1,000 to 1,200-ft hauls, the TS-360 and TS-260 motor scrapers are loading, hauling and dumping tough-to-handle waxy clay with 30 percent sand on a bed of shale. Even in this rough material, which normally slows down production, the Allis-Chalmers units have been cutting cycle time. The curved bowl bottom with offset cutting edge brings a real boost to loading cycles. Incoming dirt breaks up and rolls into the bowl, filling it with heaped loads . . . faster.

Lower cost per yard

Joe Duncan reports that his Allis-Chalmers equipment can dig, haul and place dirt for a lower-per-yard cost . . . move as much dirt as higher-rated capacity units.

"Our operators like our Allis-Chalmers equipment, too, because of the operating ease, riding comfort. You get a lot more production when the crew likes the equipment," adds owner Duncan.

Find out for yourself how productive Allis-Chalmers construction machinery can help improve your profit picture on a wide range of land improvement work. Ask for all the facts—and a working demonstration of real dirt-moving efficiency. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

Look ahead...*move ahead* with ALLIS-CHALMERS

YOUR CHOICE ON RUBBER!

ALL truck cranes are not alike! Don't buy a truck crane without comparing the advantages Northwest brings you.

Look at the booms—the greater strength is obvious. Pivoted gantries are easily raised and lowered for clearance. Removable counterweight makes the reduction of gross weight a matter of minutes. Independent High Speed Boom Hoists are power controlled in both directions and operate independently of any other machine function and without sacrificing either of the main hoist drums.

Sectional boom hoist rigging and pendant lines make possible quick adjustment to boom length changes. Telescopic boom struts are standard. Extended boom point sheave shaft for pile driver leads, adjustable jibs, 3rd drums, all can be had to meet your requirements.

Lastly, remember Northwest carriers are not to be confused with carriers supplied for any other crane. They are Northwest designed—built to Northwest specifications with advantages found in no other crane carrier.

A Northwest man will be glad to give you full details—remember two sizes to select from—25-ton and 35-ton capacity. Get the whole story before you buy.

NORTHWEST ENGINEERING COMPANY

1506 Field Building, 135 South LaSalle Street
Chicago 3, Illinois

THE GREATEST COMBINATION OF PROVED ADVANTAGES EVER BUILT INTO A SHOVEL, CRANE, DRAGLINE OR PULLSHOVEL

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS • TRUCK CRANES

Here's why TWINS

Euclid Twin-Power Protects Your Profit Margin

21% faster than single engine units

In loading ripped and shot rock for the 1,300,000 yd. U. S. Highway job at Meacham, Oregon, two "Twins" saved better than 6 cents a yard over single engine rigs for Rogers Construction Co.

"Couldn't be done with scrapers"

In Delaware, Barney Zinick tackled a million yard riverbank stabilization and bridge approach project with 3 Euclid "Twins"—moved 4000 yds. per shift over a 3000' haul—although the Corps of Engineers figured it would be a dragline job.

Handles complete road job

The first rubber-tired scraper for R. L. Eatherly Construction Co. of Nashville was a Euclid "Twin". In 4 weeks this one rig handled all earthmoving, grading and surfacing (50,000 yds.) for a state road connecting U. S. 70 with Oak Ridge.

Only "Twins" could operate

Heavy rain did not stop "Twins" from loading clay and sand for L. W. Edison's 2 million yard expressway project at Grand Rapids, Michigan. This contractor rates the "Twin" as the most efficient scraper available today.

Averaged 350 yds. per hour

Bidding on "Twin" performance, N. A. Degerstrom beat 23 contractors and wet weather . . . moved 14,500 yds. in 31 working hours on one section of the 900,000 yd. job near Davenport, Washington.

Self-load at 10,000 ft. elevation

Two "Twins" are stripping overburden at J. R. Simplot Company's phosphate mines in Idaho. They self-load, climb 50-60% adverse grades on the return, and move as much as 300 pay yards per 50 minute hour.

are moving the cheapest dirt!

"EUC" TS-24 outperforms any other scraper

Combine two engines (300 h.p. in front and 218 in back), two synchronized Torqmatic Drives, all wheel drive, and job-proved Euclid hydraulic scraper operation with 24 yd. struck capacity and you have the most productive scraper in the field today . . . the TS-24 Euclid "Twin".

Many other design features like 4-section cutting blade, extra-strength construction, easy-loading bowl design, planetary drive axles, NoSpin differentials and 27.00 x 33 tires (33.5 x 33 optional) contribute to the unmatched performance of "Twins".

On job after job—small grading work to big yardage projects—Euclid Twin-Power Scrapers have moved dirt at lower cost than other scrapers. They can do the same on your jobs and protect your profit margin in spite of rising costs. Your dealer has job studies with actual production and cost data that will be helpful—just ask for "Twin Facts".

Be sure to check your dealer's schedule for showing the new color film "Memo to the Winning Contractor"—in less than half an hour you'll "visit" a wide range of jobs and see for yourself why "Twins" give you a big edge in bidding.

30% more payloads

Working with single engine scrapers at the Jackson, Alabama Lock and Dam project, a "Twin" bulled through adverse material that delayed other scrapers, and moved almost a third more payloads.

42 "Twins" on Toll Road

On the Illinois Toll Road where bidding competition was keen, eight contractors have put a total of 42 "Twins" to work. "Twin" performance is helping overcome wet weather conditions that stop other scrapers.

3500 yds. in 10 hours

For expansion of Vancouver Island airport runways, Hassel Bros. Ltd. used two "Twins" . . . overcame weather delays and adverse conditions. . . . moved 7,000 yds. in a 10 hour shift, self-loading clay and gravel.

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Your Euclid Dealer offers the best equipment investment

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FOR MOVING EARTH, ROCK, COAL AND ORE

"a ticklish job... demanding pin-point control"

Says **Del Newell,**
Job Superintendent, TOWNSEND AND BOTTUM, INC.

Working side-by-side, two Manitowoc 60-ton cranes placed 142 ft. long trusses 100 feet high at the Dan E. Karn Power Plant of the Consumers Power Company project near Essexville, Mich.

"Although hampered by constant winds blowing off Lake Huron—sometimes as high as 40 mph," Mr. Newell said, "The team of Manitowocs, equipped with 120′ booms and 30′ jibs, lifted the heavy trusses to the 100′ height, held, walked and positioned them to the point where the steelworkers could bolt them into place. Since the structural unit was too large for the men to move, they depended entirely upon the crane's precise controls to line up the bolting holes."

Ticklish jobs like the Dan E. Karn project are everyday jobs for Manitowocs. Equipped with torque converter, the precise lifts are smooth and fast . . . operators have easy, fraction-of-an-inch control, yet never lose the "feel" of the machine.

The unusual stability of these cranes contributes to the ease of making high, heavy lifts, as well as to the safety of such lifts. A low center of gravity and balanced design, give the unit extremely solid footing and equal load distribution.

There is a Manitowoc for every construction job . . . your distributor can give you details on the full range of Manitowocs and show you units that will make your jobs easier and more profitable.

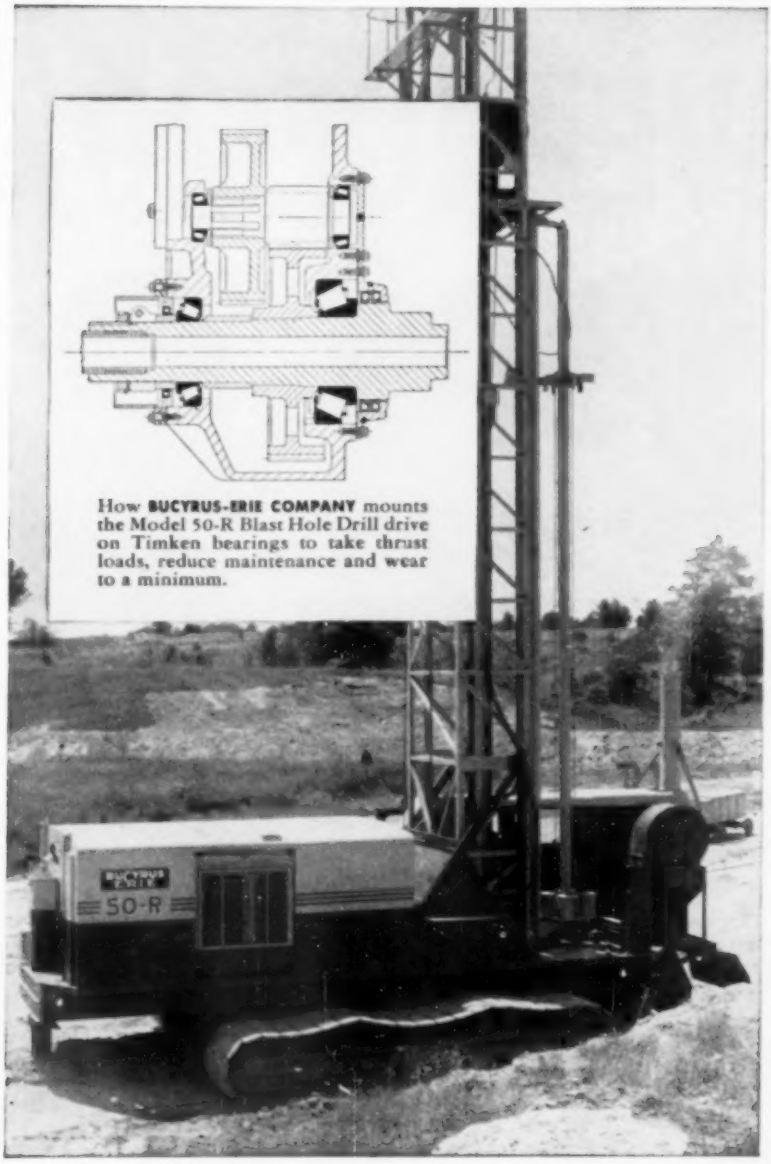
Manitowoc

MANITOWOC ENGINEERING CORP.

MANITOWOC, WISCONSIN

CRANES	SHOVELS	DRAGLINES	TRENCH HOES
20 TON - 100 TON	½-YD. - 5½-YD.	½-YD. - 6-YD.	½-YD. - 2½-YD.

TIMKEN® bearings help massive rotary drill take big blast holes in stride



How **BUCYRUS-ERIE COMPANY** mounts the Model 50-R Blast Hole Drill drive on Timken bearings to take thrust loads, reduce maintenance and wear to a minimum.

DEVELOPED to meet demands for a big hole rotary blast hole drill, this Bucyrus-Erie 50-R can drill up to 12¼-inch holes with a speed never before possible. To take the terrific thrust loads on the drill bit (up to 30 tons) while drilling hardest quarry formations, and also to maintain accurate gear mesh, Bucyrus-Erie Company mounts the main and intermediate shafts of the rotary drive on Timken® tapered roller bearings.

Taking heavy thrust loads is routine for Timken bearings. That's because: 1) The tapered construction enables Timken bearings to take *both* radial and thrust loads in any combination, and 2) Full line contact between rollers and races gives Timken bearings extra load-carrying capacity.

Results show up in many cost-saving ways. With Timken bearings shafts are held in rigid alignment. Gear mesh is smooth and accurate. Shaft wear is eliminated, gear wear reduced. Parts last longer and operate steadily at peak efficiency.

What's more, Timken bearing rollers and races are case-carburized to give them hard, wear-resistant surfaces over tough, shock-resistant cores.

Only Timken bearings give you so many advantages. We even make our own fine alloy bearing steel. We're America's only bearing manufacturer that does. For the most long-lasting, money-saving performance, specify Timken bearings for the machines you buy or build. Look for the trademark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.

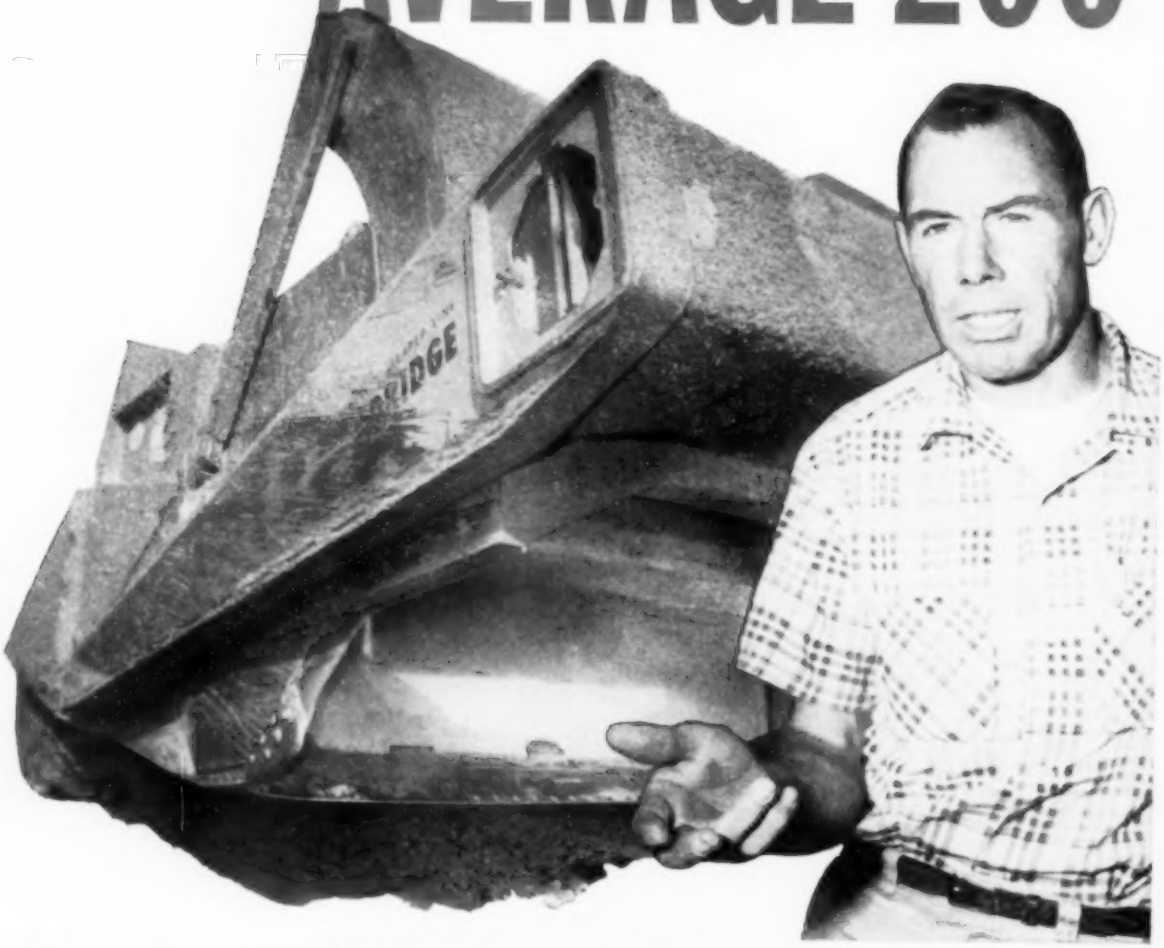
TIMKEN

TRADE MARK REG. U.S. PAT. OFF.

TAPERED ROLLER BEARINGS **ROLL THE LOAD**

ESCO CUTTING EDGES

AVERAGE 200



RICHARD CHAFIN, project engineer of Madonna Construction Company, uses ESCO cutting edges to keep maintenance costs low.

HOURS OF SERVICE
...on each side!

The Madonna Construction Company switched to *ESCO* cutting edges after on-the-job tests that "represented every known strata in southern California." Richard Chafin, project engineer, relied on *ESCO* bits to move 200,000 yards of sandy gravel, studded with 36-inch donickers... and in doing so compiled maintenance figures that showed *ESCO* bits averaging 200 hours before reversing.

Cutting edge longevity is only half the story. Bits that last longer mean less down time, lower charges against machinery idled through frequent bit changes. *ESCO* cutting edges, Chafin found, maintained the 150 cubic yard-per-hour rate that he considers essential if earth moving is to pay.

What *ESCO* products did for this project engineer, they can do for you. Put *ESCO's* durability to work for you. Use *ESCO* cutting edges —they'll save you time, when time is money.

See your nearest ESCO dealer or write direct.

ESCO®

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TOP VALUE in embodiment of basic requirements —
TOP VALUE in wide adaptability to hauling needs —
TOP VALUE in lightness compared with load capacity (only 9,000 pounds)
TOP VALUE in ease of hauling — and maneuverability —
TOP VALUE in fast, safe braking —
TOP VALUE in returns on your investment —
TOP VALUE in general all 'round satisfaction.

25 TON CAPACITY to haul a large percentage of loads

DESIGNED FOR LIGHTNESS without sacrifice of strength. (Only 9,000 pounds)

ALLOY STEEL MAIN BEAMS from "tail" to and including gooseneck

EMBODIES ALL BASIC FEATURES

VOLUME PRODUCED to insure a low price

BEAVER TAIL END for easier loading and lengthened load capacity

LONG FLAT GOOSENECK carries bulldozer blades, dippers, etc.

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Attention of .....

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Albion, Penna. EXPORT OFFICE: 50 Church St. New York 7, N. Y., U. S. A. Cable Address: BROSITES

Making Mighty Dams From Rugged Granite Mountains

Construction of a series of power company dams in North Carolina required excavation in several granite mountains. This 4-yard Marion 111-M shovel produced a big daily output even in the most difficult digging—making it a logical companion for today's big haulage units.

Marion 43-M hoe speeds completion of a new sewer line. The 1-yard machine digs to a maximum depth of 26 feet. Like every machine in Marion's extensive line, the 43-M is built for fast, efficient, heavy-duty work.

MARION

MARION POWER SHOVEL COMPANY—MARION, OHIO, U. S. A.

A Division of Universal Marion Corporation

PROOF!

To Whom It May Concern:

You can be sure of making the wisest investment and obtaining the most productive equipment by inviting leading manufacturers to participate in competitive on-the-job demonstrations with qualified operators.

The demonstration reported here was held last year at my request and I personally kept the records of the times and tonnages in all instances.

The results gave me definite proof of the superior performance of the "PAYLOADER" machine and was the basis for my recommendation for the purchase of this equipment.

Phil Bigham

PHIL BIGHAM
County Engineer
Barton County, Kansas

Independent Tests with Factory-Trained Operators Prove PAYLOADER® Best

You can't make money on manufacturers' claims. It's performance on-the-job that counts. That is why we welcome the opportunity to report the results of independent, unbiased competitive tests such as the one tabled below. "PAYLOADER" tractor-shovels will not only give you greater performance and production . . . they'll PROVE it on your job.

	Run No.	Travel Distance	Model HO PAYLOADER	Machine "A"	Machine "B"
Loading Trucks from Stockpile... Tons per Hour	1	——	432	289	222
	2	——	391	324	254
	3	——	366	311	259
	4	——	358	288	285
Loading Trucks from Windrows... Tons per Hour	5	150 ft.	327	192	207
	6	150 ft.	313	192	178
	7	100 ft.	390	262	240
	8	100 ft.	394	274	253
Overall Average...Tons per Hour			**371**	**267**	**237**

Ask about . . .

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THE FRANK G. HOUGH CO.

LIBERTYVILLE, ILLINOIS

SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

*Available in Continental U. S. A.

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Send more data on 4-wheel-drive "PAYLOADER" tractor-shovels as checked:

- ☐ HO—9,000 lb. carry cap. (1 to 4 cu. yd. buckets)
- ☐ HH—7,000 lb. carry cap. (⅞ to 3¼ cu. yd. buckets)
- ☐ HU—5,000 lb. carry cap. (⅝ to 2½ cu. yd. buckets)

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Title.....

Company.....

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City..... State.....

4-B-1

Canal Contractors Benefit from Bucyrus-Erie Draglines—So Can You!

Sticky gumbo and soft footing made it tough for this 54-B. But the Bucyrus-Erie features that spell dependability on any job are at work for the contractor. This job is an improvement project for the Los Angeles River. Another 54-B is at work on this contract.

"I have never run across a comparable machine that is as durable or as fast as our 22-B," says the owner of the machine shown here. This dragline excavates earth in reconstruction of a drainage canal in New Mexico. It is owned by Joe A. Victor & Son, Albuquerque, N.M.

At a large mine in western United States, this Bucyrus-Erie 54-B excavates a channel leading to a settling basin for industrial wastes. The channel will carry water from the basin to a river outlet. Material excavated is gravel and dirt. This dragline and other 54-Bs on the property are praised by their owner for their long period of successful operation.

Here is one of four Bucyrus-Erie 38-Bs working on a large irrigation project south of Mexicali, Mexico. In this major cotton-producing area, fields must be flooded with water, which runs off into drains. To provide water for the crops in this extremely dry region, hundreds of thousands of pesos have been spent in construction of irrigation facilities. On this job as on similar jobs everywhere, the choice of excavators is Bucyrus-Erie.

Irrigation, drainage, and flood control contractors benefit from the high output performance of Bucyrus-Erie draglines. Available in a full product line with capacities ranging from ⅜ to 4 cubic yards, Bucyrus-Erie draglines combine balanced digging cycles with smooth operation and exceptional stability to deliver top output day after day, all year round. Compare the jobs shown here with your own. Read the capsule stories. Then get full details on how these machines can benefit you. See your nearby Bucyrus-Erie distributor today. 462E58C

BUCYRUS ERIE

A Familiar Sign at Scenes of Progress

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

The best bucket for the best dragline is a Bucyrus-Erie bucket. Fast loading, smooth carrying, rapid dumping, these buckets have *durability* provided by BECOLOY. New-design buckets are available in a wide range of sizes—solid or perforated baskets—for light, medium, or heavy-duty work.

*Available in Continental U. S. A.

City..... State.....

4-B-1

If You Use Blasting Caps

EXAMINE THESE FEATURES

1 DEPENDABLE FIRE—Special alloy is used as the bridge wire in the firing element of Hercules Electric Blasting Caps. Wire is noncorrosive.

2 ENGINEERED SHELL—Bronze shell of a Hercules cap goes through fifteen separate operations while it is being expertly shaped.

3 TOUGH, HIGH DIELECTRIC INSULATION—Leg wires of Hercules caps are coated with plastic insulation for outstanding toughness, resistance to abrasion, superior dielectric qualities.

4 SECURELY ANCHORED—A cast sulfur plug in the upper part of shell anchors entire firing mechanism in place.

5 WATERTIGHT WATERPROOFING—A special Hercules waterproofing formulation minimizes the possibility of moisture or dampness penetration.

6 7 DOUBLE-PACKED WALLOP—Bridge wire extends into the priming charge and makes positive contact to give rapid ignition.

XR58-1

HERCULES BLASTING CAPS

Partners in Dependability with Hercules® Explosives

HERCULES POWDER COMPANY

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Outside Camarillo, Calif., U. S. 101 is being relocated and improved. J. E. Haddock Ltd. is handling 5-mile project, moving a million and a half cu. yd. — mostly rock. Haddock moves about 7,000 cu. yd. a day.

Four CAT D9 Tractors are on the job here, along with five D8s, three No. 12 Motor Graders, three DW21s with Scrapers, three DW21s with Athey PR21 Wagons, and a D13000 Caterpillar Diesel Engine.

Two of the three Caterpillar DW21 Tractors with Athey PR21 Wagons loading up for another fast rock haul on U. S. 101 project. Conditions like this explain why Project Supt. Saul says he picked Caterpillar for its "ability to do the tough work."

Athey PR21, teammate of DW21 Tractor, can haul 34 tons of rock or other material efficiently. On this job it hauls about 18 cu. yd., making 1-mile round trip in about 12 minutes—against a return grade of 12% in places.

RELOCATING U. S. 101

"This job is plenty tough. We called on Caterpillar-built equipment for this one. We get good service with very little down time—and then our Caterpillar Dealer goes all out to see that our machines are back at work as soon as possible."

Project Supt. Neal Saul's words should ring a bell for you, too. See *your* dealer for the machines that handle the tough jobs in stride. See him for replacement parts you can trust. See him for the fast, thorough service that keeps your machines making money.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR

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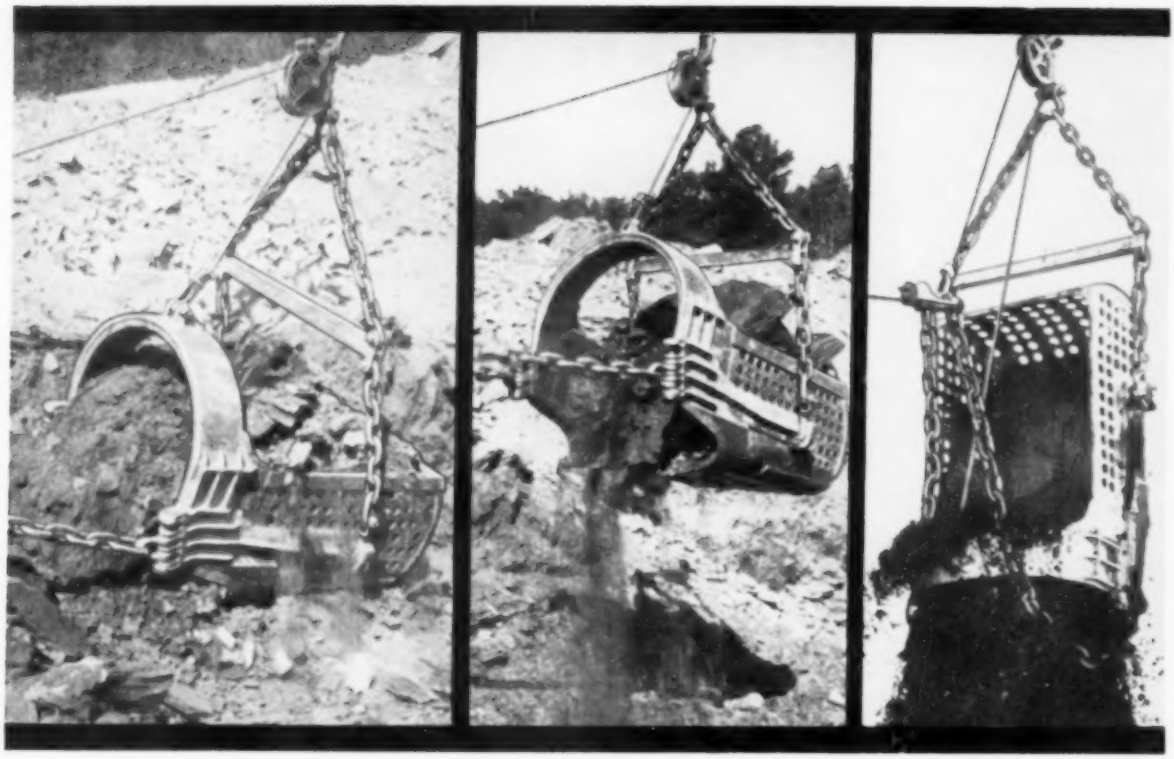
WHEN THE JOB IS PLENTY TOUGH

D9 with No. 9S Bulldozer moves rock in a hurry. The LOAD SHAPE No. 9S is a 14-ft. blade with a cutting edge made of "Hi-Electro" hardened steel. A push cup mounts easily, right onto the blade, when desired. The D9 delivers 320 HP at the flywheel. With its optional three-stage torque converter, the D9's output is automatically matched to the load.

M.M.M.A.L.C.P.Y.*



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DRAGLINE BUCKETS

"A Type for Every Digging Purpose"...
¼ to 40 Cubic Yards-Perforated or Solid

HENDRIX MANUFACTURING COMPANY, Inc.
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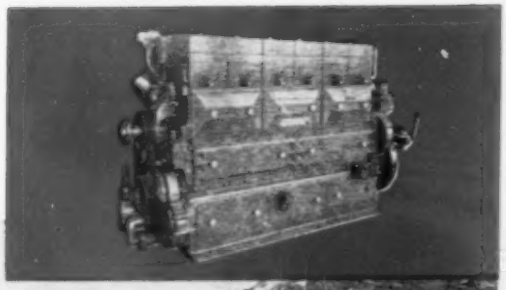
***MOVE MORE MATERIAL AT A LOWER COST-PER-YARD**

powered by White's Superior Diesel



Manitowoc 4500 cuts Ohio Stripper's cost 20%

Careful equipment selection is paying off for Terramana Brothers Coal Co., Steubenville, Ohio. For digging into 70 feet of overburden, they chose a Manitowoc 4500 shovel . . . and wisely specified the rugged, dependable White Superior Diesel for power. According to Terramana Brothers, this perfect combination greatly increased production and cut operating costs . . . resulting in more than 20% overall savings!

The big 4-yd. rig with a 60-ft. boom and a 45-ft. stick works two 10-hour shifts daily, powering away almost 400 yards per hour. The high torque Superior engine provides more line muscle . . . it pulls a full dipper with little effort. Under light load, it enables swings at top speed without surging. The faster and smoother cycle increases production!

Many cost saving advantages of Superior's design simplicity also contribute greatly to this economy. Easy accessibility of internal parts speeds servicing in close quarters. Down-time is practically eliminated because maintenance and repairs are reduced to a minimum. Many case histories show 35,000 engine hours with no major replacement parts required. Superior's first valve job usually comes due long after other engines would be completely replaced! Highly developed, open chamber combustion achieves optimum air and fuel mixture, low fuel consumption and easy starting. Precision construction throughout reduces wear and assures lowest lube oil consumption.

Specify White's Superior Diesel on your next new shovel or when you're re-powering. Power ranges from 225 to 2150 B.H.P. for all types of service. *Write for complete information today.*

White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY

Plant and General Offices: Springfield, Ohio

Excavating Engineer
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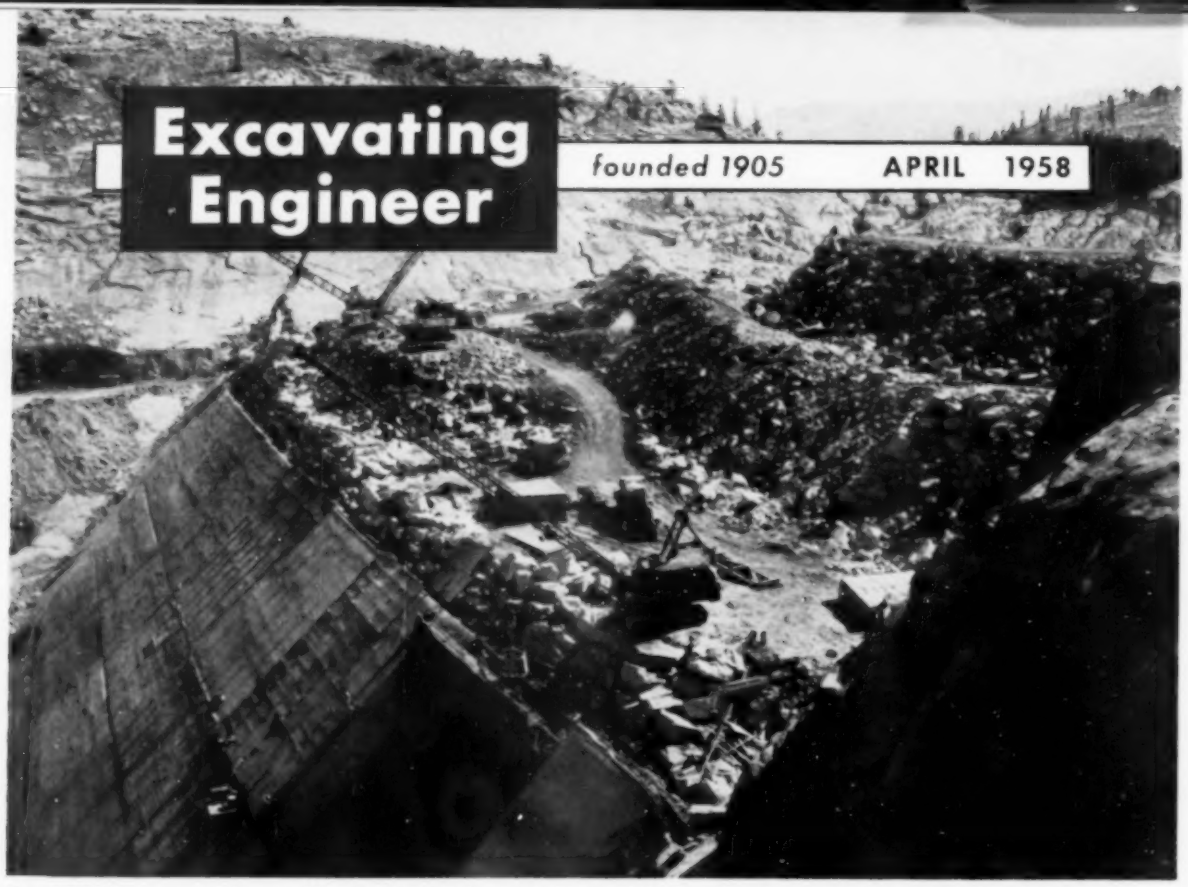


Courtright Dam, one of two rockfill structures being built for a utility firm, has a steep upstream slope faced with concrete.

Joint Venture Group Pushes Dam Project

by Ray Day

AMONG granite pinnacles of the Sierra Mountains, 60 miles east of Fresno, Calif., skill in excavation and rock handling has reached new heights with the construction of Courtright and Wishon dams. The dams call for producing and placing hard granite in pieces carefully chosen as to size, and both jobs are complicated by problems in access, supply, altitude, organization and a short work season.

General contractors on the rockfill retention structures are Morrison-Walsh-Perini, a joint-venture combine. Morrison-Knudsen Co., Inc., of Boise, Idaho, is sponsor; Walsh Construction Co. and the Perini Corp. are participating contractors.

These firms have devised methods and adopted practices that are resulting in substantial savings to themselves and the contracting agency, Pacific Gas & Electric Co., San Francisco, Calif.

The contractors:

1) Developed two new ways to handle big rock, eliminating the need for cable slings.

2) Used a slip-form method of placing concrete on the upstream dam face, simplifying that work.

3) Improved the ammonium-nitrate technique of blasting with the use of 400-grain Primacord, simplifying and making safer rock shooting.

4) Organized personnel crafts with a colored hard-hat scheme, simplifying supervision and freeing foremen and superintendents from confinement near radio cars.

5) Developed refinements in preventive maintenance, keeping equipment on the production line 20 hours a day, six days a week, through the effective work season.

Together with certain savings the above help pass on to the contracting agency, PG&E has come up with some economy ideas of its own based on engineering design and dam specifications. Both Courtright and Wishon were planned with upstream slopes ranging from 1 on 1 to 1.3 on 1, thereby reducing the amount of rock yardage needed.

Reduce Rock Blanket

Thickness of a placed rock blanket along the face of the dams has been reduced to 11 feet at the crest and 19 feet at the toe, another cost saver because a placed rock blanket is always an expense problem. On Courtright and Wishon, the placed rock amounts to about 5½% of the volume required, but its cost represents nearly 30% of the total expense. Well engineered re-

California utility firm's hydro-electric program calls for construction of dams in Sierra Mountains. Contractors face problems in organization, rock handling and a short work season.

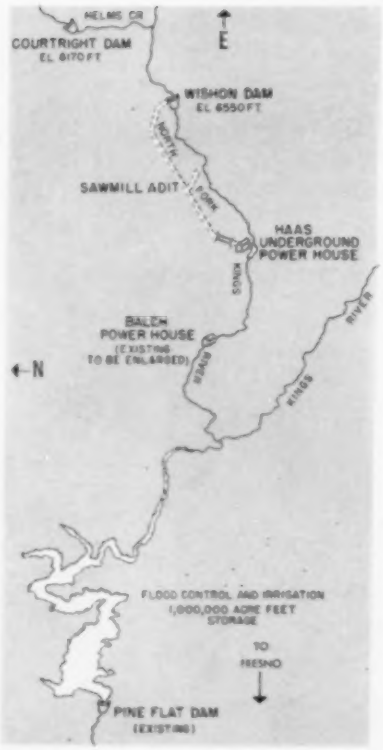
KILOWATT MAGIC

At a constuction cost of $80 million for the development of 261,500 kilowatts of hydroelectric energy, the Kings River project by PG&E is one of the most ingenious and economical river harnessing schemes ever attempted. Since the turn of the century, imaginative engineers have dreamed of power development on the Kings' North Fork. Final development, now almost a reality, had to wait for an expanding market, investment money and construction of the 1,000,000 acre-foot Pine Flat flood control and power reservoir.

In essence, the project fully utilizes a 1½-mile power drop on one of America's best hydroelectric streams, then saves the water for vitally needed re-use in irrigation and domestic service on the valley floor. This is conservation at its best.

Power drops in excess of 2,000 feet are commonplace with PG&E. Two such heights are in this system: a 2,444-ft. drop at the new Haas underground powerhouse and a 2,400-ft. drop at Balch powerhouse. Beefing up the existing facilities at Balch, plus addition of extra generators, will improve performance of that 30-year-old installation.

Despite its impressive Kings River accomplishment, PG&E is not resting on laurels. Under way in the San Francisco Bay area is a small-scale atomic power plant. Other hydroelectric projects are being built in the mountains. The company's investment of private capital for the production of a public utility in a taxable market is American strength at its best—functioning for the public good.



Kings River hydro system includes three dams and two generator stations.

ductions in the thickness of that material, therefore, are well justified.

PG&E also has written its specifications for concrete facing to permit fullest use of whatever ingenious ideas the contractors could devise.

Despite a general similarity between Courtright and Wishon dams, there are important differences in locations and topography. Courtright is located on Helm's Creek, a tributary of the North Fork of Kings River. Wishon is located on the North Fork itself.

Courtright is one of the highest rockfill dams in the world. Its crest elevation is 8,174 feet above sea level, and its over-all height is 310 feet from bedrock foundation to crest.

Despite this height, Courtright has a crest length of only 850 feet because it is situated in a steep-walled granite gorge, the sides of which were practically swept clean by glaciers ages ago. While the Courtright site would have been a good concrete-arch dam location, up to date drilling methods and modern excavating equipment made the use of a rockfill barrier considerably more economical.

When completed, Courtright Dam will have a volume of 1,500,000 cubic yards of rock fill and be faced with 30,000 cubic yards of concrete slab. A 102,000 acre-foot reservoir will be used in a regulatory capacity to firm hydro-

A 6½-yd. electric shovel (left) and a 2½-yd. diesel unit team up to load rock into 17-yd. Euclids at Courtright quarry.

Workmen guide placement of chunks of granite that serve as a blanket for concrete slab facing. Size of rocks is limited only by capacity of equipment used to handle them.

electric power in the powerhouses below Courtright and Wishon dams.

Wishon Dam is in considerably different terrain. Only three miles downstream from Courtright, it is 1,624 feet lower in elevation. The Wishon site is in a more gentle mountain basin, whose abutment slopes are much flatter than those at Courtright. Therefore, Wishon's crest length, at elevation 6,550 is 3,350 feet.

Structure Details

Wishon rises 290 feet above bedrock foundation. Because of a much greater length, it will contain 3,700,000 cubic yards of rock fill and 100,000 cubic yards of reinforced-concrete upstream facing. It will also have a 30,000-cfs spillway, equipped with six 40 x 12-ft. radial gates. By comparison, the Courtright spillway provides for only 8,000 cfs.

In construction details the two dams are similar. A cutoff trench three feet wide and about five feet deep is being dug along the upstream toe of both structures. This trench, backfilled with concrete, forms the base of the reinforced-concrete slab which covers the upstream face of each dam. A grout curtain, with pipes inserted on 10-ft. centers, is injected along the upstream toes as work progresses.

The main embankments of the dams are composed of dumped rock, quarried nearby as possible. Actually, the terrain is so rugged in granite outcroppings at each site that earthfill designs could not be considered. Specifications do not limit rock sizes. Dimensions are governed only by the capacity of shovels and trucks which handle them. At Wishon, for example, a 19.2-cu. yd. chunk was picked up, trucked, dumped and handled successfully in one piece.

Similarities also exist in rockfill specifications. Both dams call for the use of three times the rock volume of water delivered by monitors in a $2\frac{1}{2}$-in. stream at 100-psi pressure. Purpose of the water stream is to bed the rock as it is placed—in point-to-point contact—thereby developing interlock strength and minimizing later settlement. The stream of water also washes fines and dirt out of the dam and fills voids between big rock with smaller, clean particles. This hydraulic requirement was one of the most carefully supervised parts of construction. John W. Stang Corp., which supplied pumps and monitors, made careful calculations to determine head, friction loss in lines, volume and effect of water applied.

Specifications for a layer of placed rock along the upstream face of both dams are similar, as are those for reinforced-concrete slabs covering the placed rock face. Thickness of the slabs varies from one foot at the crest to 20 feet 7 inches at the bottom. They are 60 feet wide and range in slope length from 31 feet 20 inches at the bottom to 77 feet 8 inches at the top. Because the face of Wishon Dam at its base probably never can be cleaned, lower concrete is being covered by a double layer of 2 x 2 Ponderosa pine, lapped and fastened with copper nails.

Slabs are supported at horizontal edges by 4-ft. wide concrete beams, with 3-ft. beams on the slope edge. These beams are half as strong in compressive strength as the slabs. The contractors theorize that if settlement occurs, the beams will settle and crack without excessive destructive breaking in the slabs.

Slab construction joints are being mopped with asphalt to permit them to slide. They are being made water resistant with copper water stops. Premoulded expansion joint material and mastic is applied above the water stops; Dow Chemical's Styrofoam in the area below.

The short work season, April 15 to Nov. 15, and the high altitude dic-

tate an organization geared to near-perfect efficiency 20 hours a day, six days a week. Contractors assigned some of their best superintendents and foremen to the job and brought in a $3½ million equipment fleet, along with needed rental equipment.

Adopt Color Code

An interesting organizational trick on both jobs was the establishment of a color code for the hard hats of men of each working craft. It adds greatly to over-all efficiency, and it frees key foremen and supervisors from their usual confinement near radio-equipped pickup trucks.

The hard-hat color code was as follows:

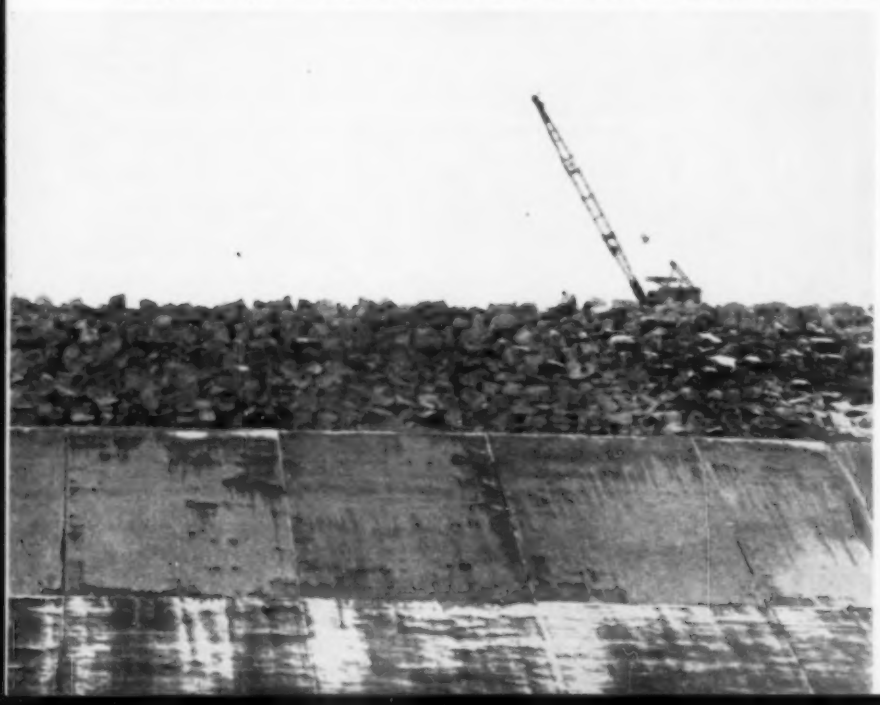
Electricians	White, with insignia
Mechanics	Blue
Carpenters	Green
Laborers	Yellow
Pipefitters	Black
Operators	Red
Drillers	White
Surveyors	Red and white check
Ironworkers	Silver
Teamsters	Orange
Oilers	White brim
Superintendents, foremen	White stripe, superimposed on appropriate craft color
Pickup trucks	Flag of appropriate craft color

Gardner-Denver drills mounted on Air Trac carriages prepare blast holes at Courtright and Wishon quarry sites, which supply fill material and selectively-placed rock.

Work on Courtright Dam is organized along mobile lines. The camp site consists largely of tents, supporting trailers and a minimum of semi-permanent buildings. All equipment is portable, except large power shovels. This allows machines to be moved in fast in the spring, guarantees good production during the work season and permits a quick getaway when winter snows begin to fall.

The camp and equipment at Wishon Dam is on a more semi-permanent basis. Barracks, mess-halls and administrative buildings are built of wood. Big equipment is typical, including, for example, the use of Ingersoll-Rand Drillmasters. A large heavy-equipment repair shop is a part of the setup.

Complete first aid and ambulance facilities were set up. In addition, a 2,100-ft. airstrip was built at Wishon which berths a Cessna 180 plane that has logged an average of 50 air hours a month. The plane chases parts and, in emergencies, carries ambulatory injured cases to a Fresno hospital, making the trip in 25 minutes instead of the three hours it takes by road. The plane is permitted to land at Wishon fully loaded, but, as a safety measure, only the pilot and two passengers are allowed on outgoing trips.



Northwest 95 cranes place rock on upstream face of Wishon Dam. Concrete on the dam's face will prevent excessive penetration of water and lower maintenance costs.

Use Portable Equipment

Drilling and shooting of solid blue granite was an important phase of construction. At Courtright, where high-capacity, ultra-portable equipment was desirable, the contractor brought in two Gardner-Denver 900-cfm compressors, an Ingersoll-Rand 900-cfm machine, two Ingersoll-Rand 600-cfm portables and four Gardner-Denver 600-cfm machines. Drills included four Air Trac

mounted Gardner-Denver DH-123's and five Joy TWM-5 machines. A dozen jackhammers completed the picture.

Drill steel was series 600 Gardner-Denver; Joy 750 steel was used with Joy machines. After some trial and error, Brunner & Lay tungsten-carbide tipped Rok-Bits were standardized upon.

Because granite is quite easy to fracture, small-diameter drill hole centers were set at 7 x 8 feet, bottoming at 2¼ inches. Ordinarily the machines averaged about 27 feet per hour. Bits were sharpened on the job after every 40 feet. Each bit took from 10 to 15 sharpenings. Because of the small-diameter holes and ground moisture at Courtright, most shooting was done with 60% free-flowing bag or gelatin powder, furnished by DuPont, Atlas and Hercules. Atlas Rockmaster blasting caps set off the charges, with delays used where necessary.

Drilling at Wishon Dam involved a much larger setup. Permanent compressor stations were used that consisted of six Ingersoll-Rand electric-driven machines on one abutment, delivering 4,200 cfm. Four similar machines were used on the opposite side, delivering 2,800 cfm. In addition, there were two Ingersoll-Rand 900 portables, three Gardner-Denver 600's and numerous smaller machines for secondary and crane-placing drilling.

Drills included two Ingersoll-Rand Drillmasters, using 6-in. bits; six large Joy machines, with 4-in. bits; a large new-model Gardner-Denver crawler-mounted machine, using 4½-in. bits; and 13 Gardner-Denver 3½-in. machines on Air Trac carriages. Timken, Joy and Brunner & Lay Rok-Bits were used on these machines, with Ingersoll-Rand bits on the Drillmasters.

Here's some of the big rock handled by shovels. Truck beds had to be specially lined with about 1,000 pounds of manganese steel to protect against severe abrasion.

Hole spacing on Drillmaster work averaged 15 x 18 feet, dropped to 8 x 9 feet on the Joy and large Gardner-Denver rig and went down to 5 x 6 feet for the smaller rigs. Footage and bit life were similar to that reported at Courtright. At Wishon, excavation in granite for the spillway furnished about one-third the total excavation volume.

Drilling went fast as the Drillmasters, with 52-ft. deep holes, produced 30,000 cubic yards of broken rock per blast. Aided by the basic advantage of their big-diameter technique, the Drillmasters at one time took care of loading requirements of a Bucyrus-Erie 150-B shovel equipped with a 6½-yd. dipper, a 120-B equipped with a 5-yd. dipper and a Northwest 80-D with a 2½-yd. dipper.

The ammonium nitrate explosive technique was used extensively at Wishon. Prilled ammonium nitrate was furnished by Monsanto Chemical Co. of St. Louis, Mo. To develop a full explosion, the nitrate was saturated 10% by weight with diesel fuel after being dropped in the holes. Usual loading methods called for a 50-lb. charge of 60% extra-strength gelatin, in 5 x 25 sticks, placed at the bottom of the hole. This was followed by a Primacord riser line with 1¼ x 8-in. gelatin strung to the top of hole. The ammonium nitrate was poured around this detonating arrangement. Holes were loaded to within five feet of ground surface and stemmed with rock cuttings.

In the completed spillway cut at Wishon Dam, a Northwest 95 crane hoists concrete forms used on the structure that will hold radial gates for spillway control.

Develop Better Economy

Some experimental shooting also was tried. Crews used 400-grain Primacord in 1-ft. sections, alternating with reinforced Primacord which reached from the bottom of the hole to the top. This eliminated the need for a dynamite primer, boosted the velocity of the ammonium nitrate explosion and developed

better economy. The average explosive ratio of ammonium nitrate to granite was one pound per cubic yard, the same as conventional powder. The blasting method gave results as good as if conventional powder had been used, according to project officials.

Loading and hauling equipment for Courtright Dam included a 6½-yd. Bucyrus-Erie 150-B shovel; a 2½-yd. Northwest 80-D machine; and 15 Euclid 63-TD trucks, whose end-dump bodies carried 17 cubic yards per trip. There was also a miscellaneous force of five Cat D8's for general bulldozing, cleaning up the quarry floor and helping a Cat 12 motor grader maintain haul roads.

Loading huge chunks of granite was bruising business and caused some problems. Truck beds had to be made more resistant to shock and abrasion, so about 1,000 pounds of high manganese steel was added as lining. Cable breakage developed when large granite chunks bounced onto the hoist cable at the dipper bail, so cable was protected with heavy steel wire-wrapped hose. Hoist cable life increased by 40% when this was adopted.

At Wishon Dam the same problems were met and solved. Loading and hauling equipment here consisted of two 6½-yd. Bucyrus-Erie 150-B's; a 5-yd. 120-B, purchased in 1941; and two 2½-yd. Northwest 80-D's. There were 22 end-dump Euclids of 17-yd. capacity and four International Payhauler units.

Meet Production Quota

The Wishon Dam loading and hauling fleet was geared to a production quota of 16,500 cubic yards per 20-hour day. This schedule was met, and a few times production went as high as 22,000 cubic yards per day.

In loading broken granite on rockfill dams of this type, a source of concern is the proper supply of large crane-placed rock for the upstream facing, just under the concrete blanket. With each foot of rise in dam height, the volume of large rock increases in ratio to ordinary dumped material. In the upper third of the structure, the ratio is greatly out of proportion to that at the base. So, a superintendent must save big rock by stockpiling as he goes along, or face the expense of producing unneeded small sizes at the windup.

On both Wishon and Courtright, the problem was solved by stockpiling large stone from current production and "banking" the chunks until the upper portions of both structures were built. This naturally meant shovel selection and considerable secondary handling.

Rock placement was similar on both structures. At Courtright, the high-pressure water delivery system consisted of three Stang 3,000-gpm pumps, and three 2½-in. Intelligiant monitors made by the Chicksan Co., Brea, Calif. The monitors have hydraulically-controlled recoilless delivery nozzles which produce a super-critical blast of water and direct this water against rock as that material is dumped.

At Courtright and at Wishon, maximum thickness of lift was 60 feet. As Euclids trucks end-dumped loads and bulldozers pushed pieces over the edge, the high-velocity hydraulic monitors forced a steady stream of water against the rock. For every truckload of rock dumped, the equivalent of three truckloads of water was applied.

At Wishon Dam, similar pumps and monitors were used. There was one double monitor setup, one monitor mounted on a single skid and one Cat-mounted monitor for mobile and hard-to-reach work. At Wishon, the fill was worked from both abutments.

Perhaps one of the most interesting

Continued on page 66

A Euclid truck dumps a load of rock at Wishon Dam while an Intelligiant monitor sluices water at high pressure into the fill.

Underground Power Plant Excavation Nears Finish

Swedish excavation methods are used to build hydro facilities deep in rock mountain.

by Ray Day

Drilling crew benches down a wall of the Haas underground powerhouse using Atlas Copco BBC-22 airleg drills. Chamber is 100 feet high, 56 feet wide and 173 feet long.

ONE of the most unusual rock excavation tasks ever done in the western United States is nearing completion. It's the underground portion of Pacific Gas & Electric Company's Kings River development program, which includes Haas underground powerhouse and connecting penstock tunnels.

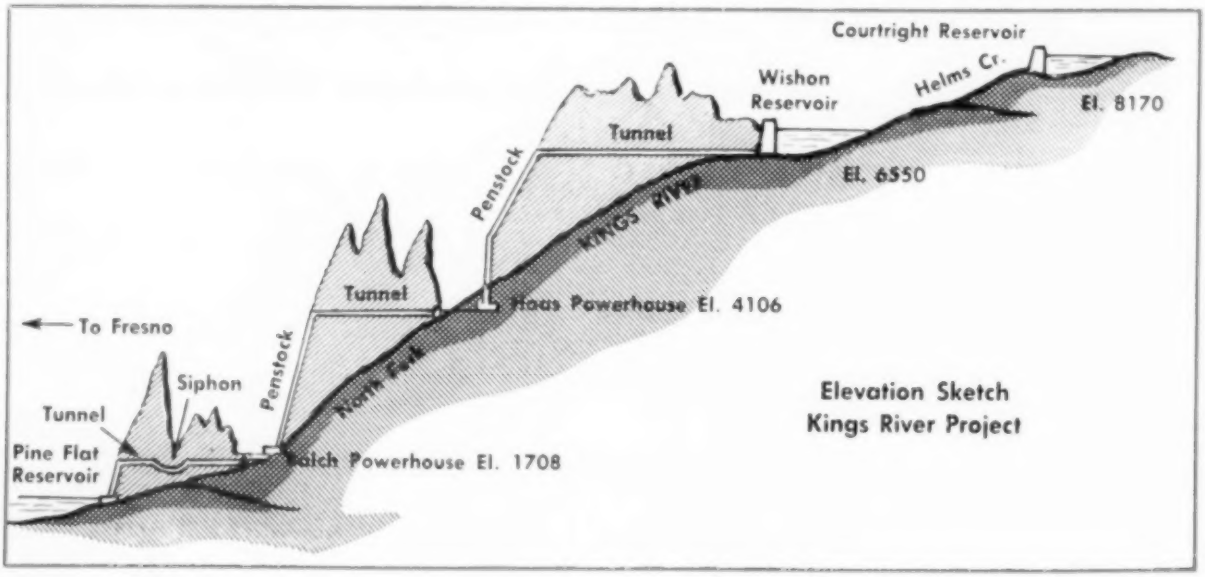
The Haas powerhouse chamber was recently completed and tunnelmen are now pushing through the last portion of a 6-mile tunnel that will deliver power-producing water to the powerhouse from a distant reservoir.

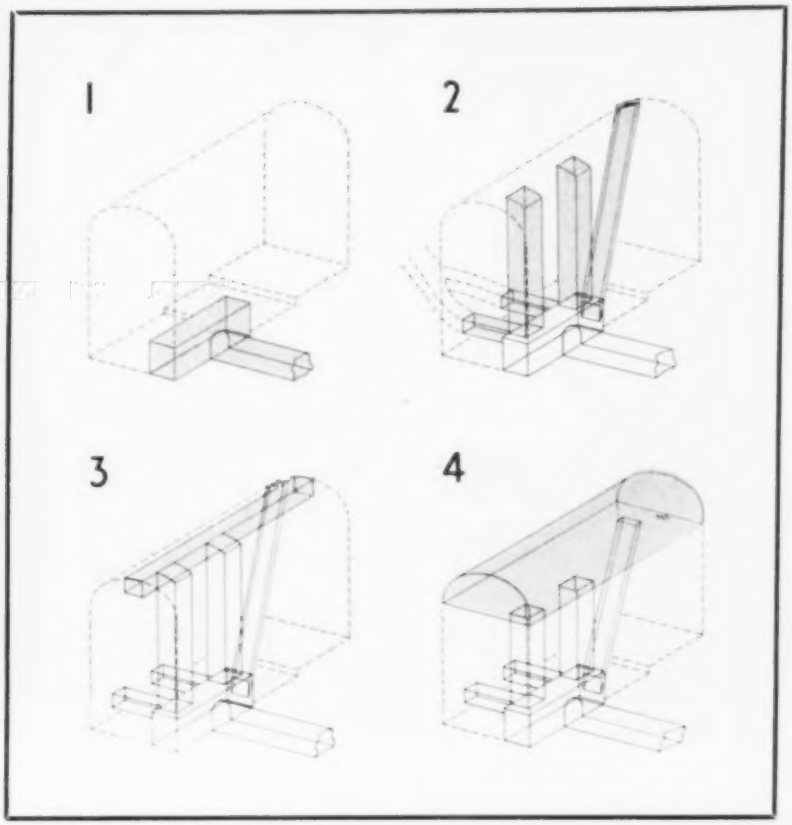
The underground phase of the Kings River project is the work of a contracting group operating under the joint name of Kings River Constructors. The joint venture is composed of Henry J. Kaiser Co., the Macco Corp. and the Perini Corp., with Morrison-Knudsen Co., Boise, Idaho, as sponsor. Morrison-Knudsen is also sponsor of another joint venture group—Morrison-Walsh-Perini—which is constructing two high rockfill dams that will store water for the subsurface facilities.

The underground excavation is tough because it's in hard blue granite. It's unique because it involves tunnels, adits, raises and the excavation of a 30,000-cu. yd. block of solid rock far in a mountainside for the underground powerhouse chamber.

This underground excavation by Kings River Constructors will help de-

Power drops of 2,000 feet through penstock tunnels will enable turbines to produce 261,500 kilowatts of hydroelectric energy.





Steps in powerhouse excavation are: 1) Drive tailrace tunnel into area and open floor level chamber. 2) Drive simultaneously vertical raises to dome, inclined manway to arch and inverted penstock tunnels. 3) Drive full length of chamber dome, connecting vertical raises. 4) Complete roof area, then bench down along walls.

velop a 261,500-kilowatt block of new hydro-electric power for PG&E. Haas tunnel, a 13-ft. horseshoe bore 6.2 miles long, will connect the reservoir behind Wishon Dam with the Haas powerhouse penstock. Haas powerhouse, 500 feet underground and 2,000 feet in from the face of a granite mountain, calls for 30,000 cubic yards of rock excavation to create a chamber 173 feet long, 56 feet wide and 100 feet high. The powerhouse also has a 9-ft. horseshoe penstock shaft 755 feet long, an 18-ft. tailrace tunnel 1,963 feet long and an 18-ft. access shaft 389 feet deep.

Rare in United States

Underground powerhouses are rare in United States hydro projects, although about 100 exist throughout the world. They are common in Sweden, where underground drilling and excavation techniques have been developed to a high degree. While Haas is actually the fourth underground powerhouse built in the United States, it's by far the most modern. Previous underground units were built between 1899 and 1913. The last one was at Spaulding No. 1 location on the Yuba River in California. It, too, was built for Pacific Gas & Electric Co.

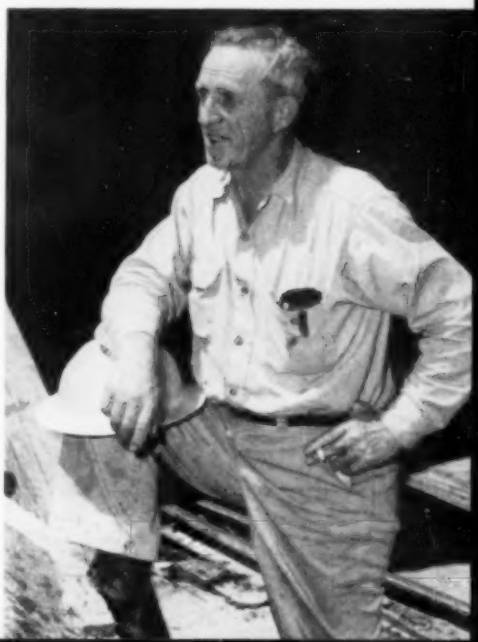
In adopting the underground design, PG&E's engineers were simply obeying laws of engineering economics. By going underground, the cost of an additional 2,000 feet of penstock was saved and an additional 28 feet of head was developed. This pressure will function for the life of the project, turning out revenue-producing kilowatts. As its design now stands, Haas powerhouse will have 128,000 kilowatts of installed capacity in vertical-shaft impulse units.

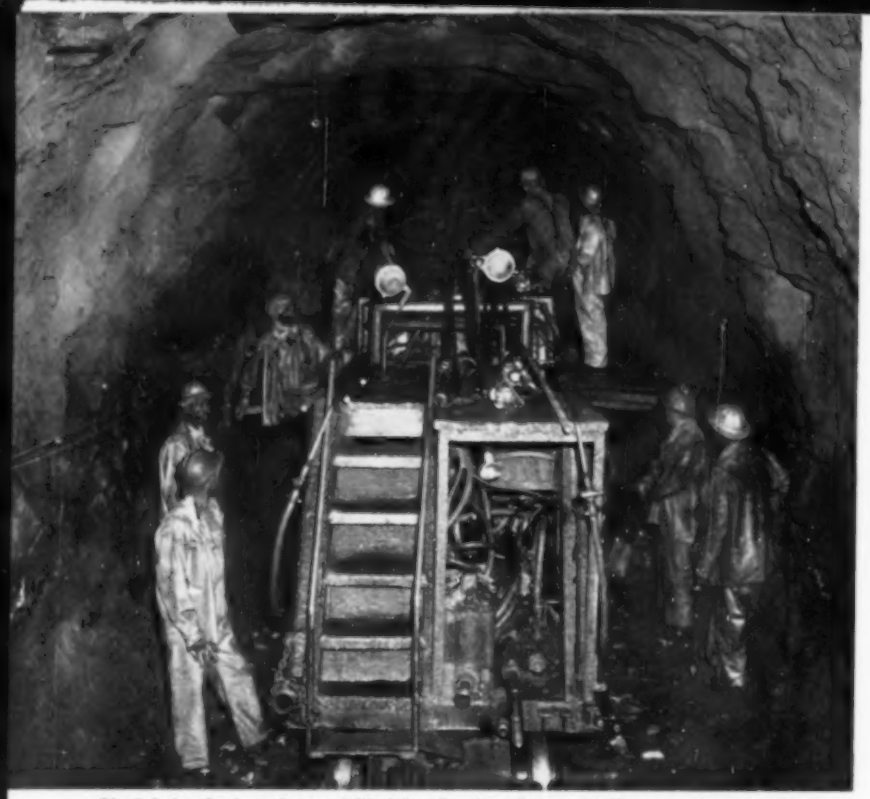
The simplified method of excavating Haas powerhouse consisted of driving the tailrace tunnel first, in order to get access to the underground location. The next step was drilling and shooting out the big underground room. Finally, plans called for completing the penstock inlets and the vertical access shaft. Driving of the tailrace tunnel, which was similar in method to work on the main tunnel, moved rapidly after its start in November 1956. By midsummer of 1957, excavation work was well along in the powerhouse. At the end of 1957, the contracting firm of Rothschild, Raffin & Weirich, San Francisco, Calif., had successfully bid actual construction of the powerhouse.

Powerhouse excavation was interesting and difficult, mainly because of the hard granite rock formation and the fact that American construction stiffs were somewhat unfamiliar with the procedure used. Excavation followed this series of steps:

1) A central floor-level chamber 16 feet wide, 70 feet long and 20 feet high

"Whitey" Lee, a 33-year construction veteran, is project manager on the Haas tunnel phase of Kings River development.





Blast holes in tunnel are drilled by Gardner-Denver drifters equipped with 1⅝-in. Atlas Copco detachable rock bits, mounted on job-fabricated jumbo shown here.

was opened. Lightweight, new-model BBC-22 Atlas Copco airleg drills with Atlas steel and tungsten-carbide tipped bits were used for drilling. Gelatin-type powder of 60% strength was shot with delays on each round. Broken rock was moved by slushers and air motors to a point where it could be picked up by Eimco 105 muckers and 6-yd. Koehring Dumptors. The latter were equipped with exhaust scrubbers to keep down fumes.

2) The inverted penstocked-feed wye, two vertical raises to the powerhouse room's roof dome and a 51° inclined manway to the extreme upper end of the arch were then driven simultaneously. The same Atlas Copco airleg drills were again used. Broken rock removed by the Koehring Dumptors was hauled from the tailrace tunnel and processed by a crushing plant to produce concrete aggregates for later use.

3) An 8 x 8-ft. drift was next opened. It ran the full length of the chamber dome, intercepting enroute the two previous vertical raises. Here, too, the same equipment was used, with compressed air supplied by electric-powered stationary Ingersoll-Rand units working outside.

4) Next, a total enlargement of the longitudinal drift, outward and downward to a point below spring line, took place, forming the entire chamber roof crown. As rock was blasted loose, slushers dragged it to the vertical raises where it dropped down to the Eimco muckers.

5) After completion of this stage, heavy drilling was suspended in order to place a gunite protective coat over the roof crown. For the first time on a United States construction project, the Swedish "Perfo" system of roof bolting was used to anchor the wire mesh gunite reinforcement into the parent rock.

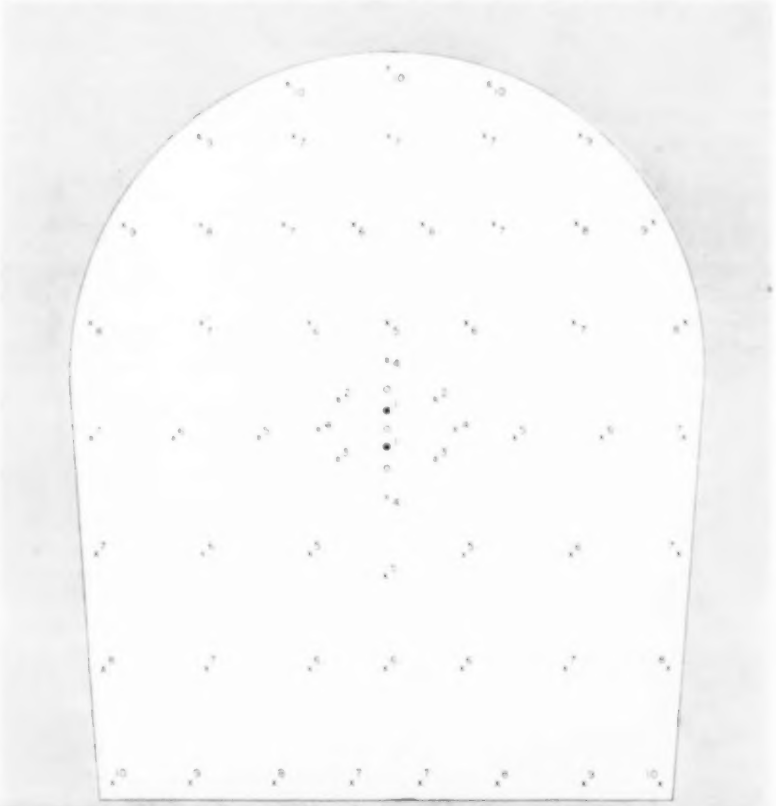
About 1,200 1½-in. bolt holes, 10, 12.5 and 15 feet deep, first were drilled into the roof granite on a 3½-ft. grid. Preformed, perforated cylindrical metal sleeves with a 1¼-in. diameter then were filled with grout, joined and inserted in the bolt holes. Rods of 1-in. diameter were driven into the mortar, their displacement forcing material out through the perforations to form a strong bond which gripped the entire length of the bolt. Wire mesh then was suspended and some 15,000 square feet of roof surface gunited four inches thick. This formed a definite safety protection to men working below.

6) Chamber excavation then was resumed, after field-adapting the Atlas Copco machines to sinker-type drilling. In addition, a group of Gardner-Denver and Ingersoll-Rand jackhammers was brought in. During this stage, the work force numbered 180 men.

7) The 755-ft. penstock shaft and the 389-ft. vertical access shaft were completed last. The latter was excavated by pilot drilling a shaft 6 x 8 feet, then enlarging it to its final 18-ft. diameter.

Record footage is being made in ex-

Holes are drilled nine feet deep in a standard blast pattern with an instantaneous burn. Crews estimate they average 40 cubic yards of granite per round in tunnel.



cavating Haas tunnel, the shaft that will carry Wishon Reservoir water through the mountain to start a dizzy 2,400-ft. power drop into Haas powerhouse. Weekly drilling totals in the 6½-mile, 13-ft. diameter horseshoe bore constantly top 600 feet and sometimes go as high as 834 feet.

Drive Access Adit

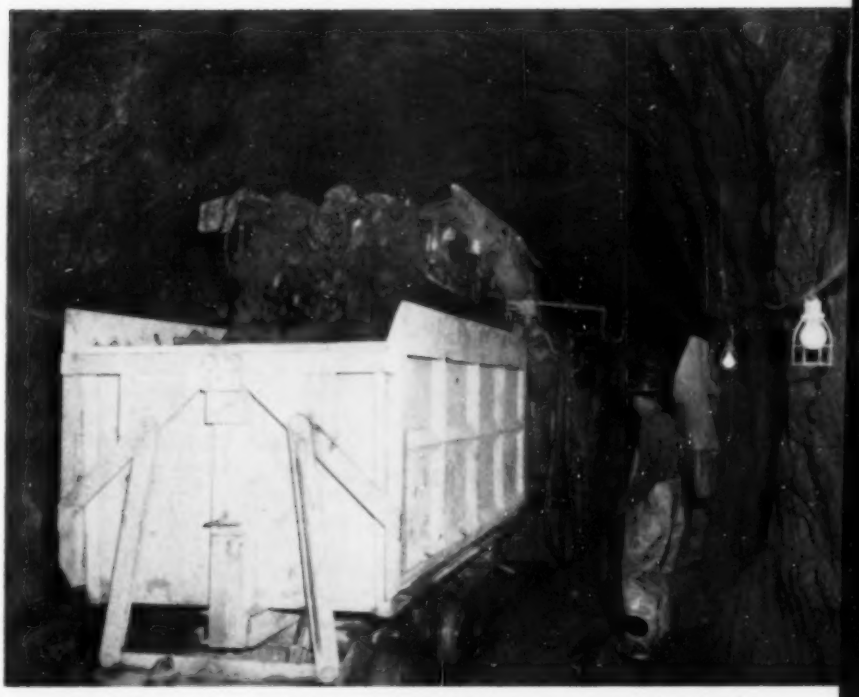
To get two headings started as quickly as possible, a 990-ft. access adit was driven at Sawmill Flats, about 3.75 miles below Wishon Dam. Main tunnel work began in January 1957 and should be finished well ahead of the November 1958 completion deadline.

Excavation follows tunneling's usual drill-blast-muck cycle, pulling from seven to nine rounds of 9-ft. depth every 24 hours at each heading. Drilling is being done by six Gardner-Denver drifters mounted on a job-fabricated, two-deck jumbo. Steel is equipped with 1⅝-in. Sandvik Coromant detachable rock bits supplied by Atlas Copco Pacific Co. There are about an equal number of Brunner & Lay Rok-Bits of the same size. The drills are powered with three Ingersoll-Rand air-cooled compressors and three Gardner-Denver water-cooled machines of 500 to 1,100-cfm capacity. Every 3,000 tunnel feet, 23-in. Joy Axivane tandem fans are placed for ventilation.

The standard blast pattern (see illustration on page 30) calls for an instantaneous center burn followed by arch, rib, breast, reliever and lifter holes. Delays through No. 10 are used to break about 40 cubic yards of rock per pound. This material is quickly loaded out by two Conway 100 muckers, with a Conway 75 for a spare, and hauled by Goodman 10-ton locomotives and 36 Western side-dump cars of 6-yd. capacity. There is a disposal area outside the adit portal.

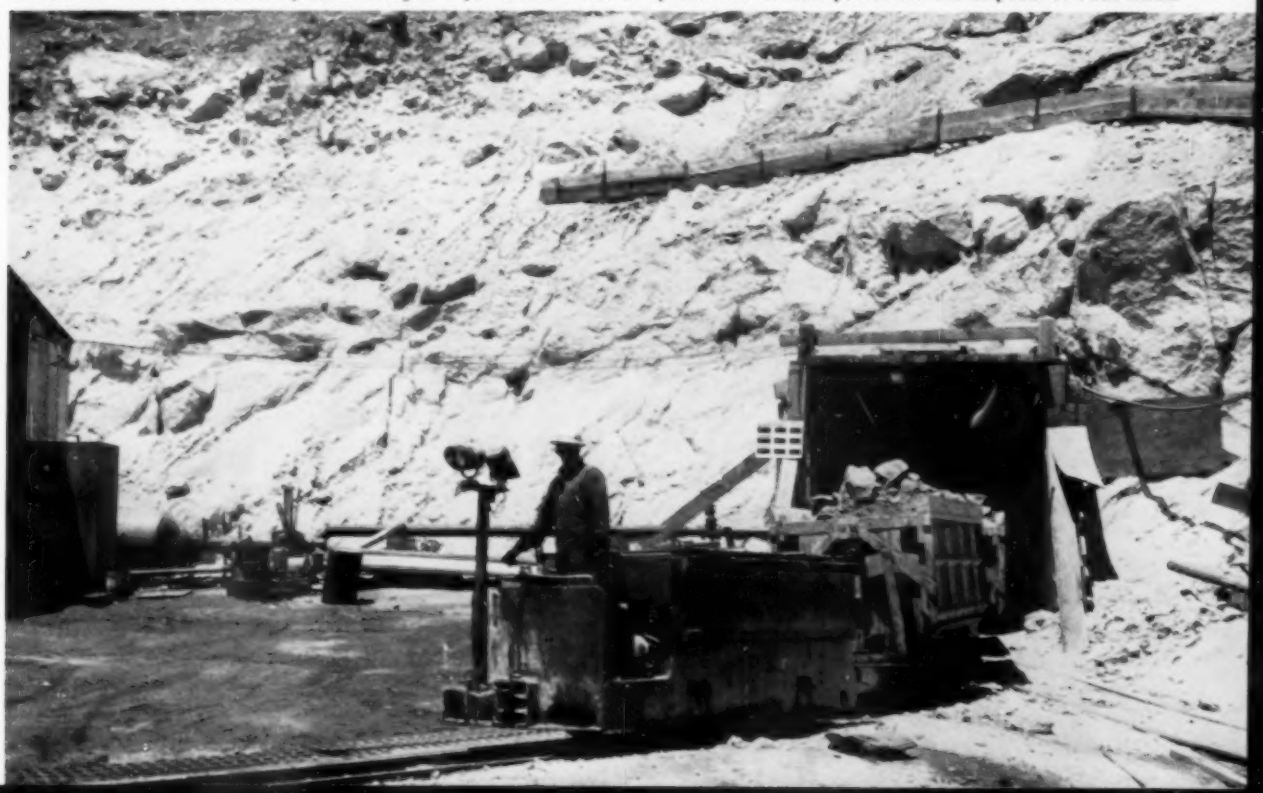
A typical heading crew, per shift, has a walking boss who supervises both headings, a shifter, six miners, six chuck tenders, a nipper, one electrician, one mechanic, one mucking machine opera-

Continued on page 67



Conway type 100 mucker is used in tunnel to load side-dump cars mounted on tracks. Crews complete three to five drill-blast-muck cycles daily, an excellent record.

A Goodman 10-ton locomotive pulls a string of 6-yd. Western side-dump cars out of adit portal for the disposal of rock muck.



How Many Lubricants Do You Need?

by D. J. Rosselle and R. J. Brossman*

Sales Technical Div.,
The Standard Oil Co. (Ohio)
Cleveland, Ohio

Special oils and greases for high capacity equipment often require a contractor to keep 20 or more drums of different lubricants on the job. Multi-purpose lubricants can simplify needs.

THE job of supplying lubricants to highway construction companies has become increasingly complex, due to the rapid mechanization that has taken place in highway construction.

Today it is possible for one contractor to move a million yards or more of dirt in a single month with the help of giant earthmoving machines, or pave as much as a mile a day of 12-ft. wide highway using a tightly knit, coordinated group of highly specialized paving and finishing machinery fed by a steady procession of trucks.

The higher speeds, heavier loads, and closer tolerances designed into the newer construction equipment have resulted in the need for higher quality lubricants. The varying lubricant recommendations for comparable equipment made by different manufacturers have created a need for multi-purpose products and simplified lubrication plans to both reduce the number of different lubricants that must be handled, and to minimize the chances of mis-application.

New manufacturers recently entered the construction equipment field, and it is already apparent that some of these people are also overlooking the need for simplified lubrication in stating their requirements for certain very special products to us. This, of course, further complicates an already bad situation.

Let's take track roller lubrication as an example. Each of five leading makes of crawler tractors has a different lubricant specified for track roller lubrication. One manufacturer specifies mineral gear oil for his track rollers and idlers; another specifies a heavy-duty motor oil; the third recommends only a special grease approved by him; the fourth also specifies a still different special grease that he must approve; and the fifth a "stringy, tacky lubricant of semi-fluid consistency."

Summarize Advice

To demonstrate the multiplicity of lubricants recommended, we have summarized our understanding of the lubricants as recommended for summer use by the five leading scraper manufacturers and five tractor manufacturers for roughly comparable equipment in the table on page 33.

This list shows 20 different lubricants that would be necessary, if the recommendations of the manufacturers were to be followed exactly—and this does not allow for alternate cold weather recommendations! Note that our simplified lube plan would reduce the total number of lubricants to 10, a 50% reduction, and four of these (circled) are used on only one manufacturer's line of equipment. In addition, we find SAE 50 motor oils recommended for transmission and final drive cases. If these five special purpose lubricants could be eliminated, a further 50% reduction in the total number to five lubricants could be realized.

When the requirements of shovels and cranes, air compressors, motor graders, rock drills, paving equipment and the multitude of other equipment that might be found on any given job are added to this, some realization of the magnitude of this problem can be gained.

We at Sohio have found that it is possible to care for almost 95% of the entire lubrication needs on most highway construction jobs with one motor oil in two viscosities, two greases and a gear oil. This means only five drums to be handled and transported out on the job. We add other products to this basic package recommendation only when we feel it absolutely necessary. This would normally be due to the fact that a piece or pieces of equipment, having an unusual requirement that cannot be satisfactorily handled by a multi-purpose lubricant, was being used on the job.

While we realize that contractors are

*Condensed from a paper recently presented at the National Lubricating Grease Institute, Chicago, Ill.

As equipment spreads grow larger and more complex for large-scale jobs, the need for simplified lubrication also increases.

familiar with the product requirements of construction machinery, we feel that a review of these requirements and the important product properties is in order. With that thought in mind, we have summarized this information below.

Engine oils—Diesel and gasoline engines found in construction equipment require a crankcase oil that performs the basic lubrication function and, in addition, maintains engine cleanliness (detergent-dispersant), resists oxidation, does not foam, has high film strength or load carrying ability, prevents bearing corrosion and affords reasonable protection against corrosion due to combustion acids. It must also have a sufficiently high viscosity index to assure easy engine starting on cold mornings, yet maintain an adequate viscosity at engine operating temperature. These requirements are all satisfied by an oil of the MIL-L-2104A level under normal operating conditions, and where fuel sulphur content is below 0.4%.

The exception to this is the extreme lubricant requirement of some new high speed super-charged engines. Series 3 motor oils are recommended for these engines and can be used for all diesel engines, if the contractor so desires.

Hydraulic oils—The primary function of a hydraulic oil is to transmit power. In order to do so it must have proper viscosity or flow properties, neither heavy enough to cause friction within the fluid itself, nor light enough to cause loss of efficiency in the system. This necessitates an oil having the proper viscosity for starting, as well as at operating temperatures, making a high viscosity index oil mandatory.

Prevent Foaming

In addition, the oil must resist foaming when sheared in the pump. Unless foaming is at a minimum, air will be compressed in the system causing erratic operation.

A hydraulic oil also lubricates the pump, bearings, cylinders, pistons and other parts. It must contain rust and corrosion inhibitors to protect the working parts of the hydraulic system.

Finally, and perhaps most important, a hydraulic oil must have good chemical stability in order to insure satisfactory and uninterrupted operation of the unit. If an oil is not stable, it will cause the build-up of gum or varnish and increase in viscosity, both of which will cause erratic performance and can result in acid corrosion of the working parts of the system.

Generally speaking, motor oils meeting the MIL-L-2104A level fulfill the above requirements.

Torque converter fluids—In general, two types of torque converters are found in construction equipment. The difference is in the fluids used. One type utilizes diesel fuel, and constantly circulates it from the fuel storage tank, through the torque converter and returns it to the storage tank. The other type utilizes a light weight oil as the fluid, and since it is a closed system, the oil is being constantly re-used for a long period of time.

Theoretically, the ideal torque converter fluid would be less viscous than gasoline for easy fluid flow, and would have a specific gravity higher than asphalt for high kinetic energy transfer. Obviously such a fluid does not exist, and so compromises are made in the selection of one of the fluids mentioned above. Both have the advantage of satisfactory performance, ready availability and reasonable price.

Torque converter fluids then should have as low a viscosity as possible for

Continued on page 68

MANUFACTURER RECOMMENDATIONS 20 PRODUCTS	SCRAPER A	SCRAPER B	SCRAPER C	SCRAPER D	SCRAPER E	TRACTOR F	TRACTOR G	TRACTOR H	TRACTOR I	TRACTOR J	SIMPLIFIED RECOMMENDATIONS 10 PRODUCTS
ENGINE OIL											
Series 3 — SAE 30	X					X					Series 3 — SAE 30
Series 2 — SAE 30							X				
Sup. 1 — SAE 30			X								MIL-L-2104A — SAE 10W
MIL-L-2104A — SAE 10W	X		X	X		X	X	X	X	X	
Type C Trans. Fluid				X				X	X	X	
MIL-L-2104A — SAE 20		X									MIL-L-2104A — SAE 30
SAE 30	X			X	X	X	X	X	X	X	
SAE 50							X	X			MIL-L-2104A — SAE 50
GEAR OIL											
MIL-L-2105 — SAE 90	X				X	X					MIL-L-2105 — SAE 140
SAE 140	X	X		X		X	X		X	X	
SAE 250					(X)						MIL-L-2105 — SAE 250
St. Mineral — SAE 140		X	X	X	X				X		MIL-L-2105 — SAE 140
GREASE											
Hvy. Duty Wheel Brg. — 300°	X	X	X	X	X	X	X	X	X	X	Heavy Duty, High Melting Waterproof Multi-purpose Grease
Chassis Grease		X		X	X		X		X		
Water Pump Grease			X		X						
Stringy-Tacky Semi-Fl.	X					X					
Magneto Grease							X				
Special Track Roller A								(X)			Special Track Roller A
Special Track Roller B										(X)	Special Track Roller B
OTHER											
Transformer Oil					(X)						Transformer Oil
No. of lubes recommended by manufacturer	7	5	5	7	8	7	8	6	7	6	

Britain's First Nuclear Power Station Rises

Full-scale commercial power plant costing $100 million will be completed in two years.

AT the site of England's first full-scale commercial nuclear power station at Berkeley on the banks of the Severn River in Gloucestershire, the A.E.I.-John Thompson Nuclear Energy Co., and its associates for this project, Balfour Beatty, Ltd., and John Laing, Ltd., are setting high standards of construction efficiency in this new field.

Work started in 1957 and all main excavations have been completed. Concreting of structures is now in progress.

The station consists of two reactors and a turbine hall with associated cooling water facilities. Balfour Beatty is responsible for the construction of the latter, while John Laing & Son are carrying out the civil work for the reactors. Civil consulting engineers for the project are W. S. Atkins and Partners.

The turbines will be driven by steam generated in boilers positioned around the two gas-cooled graphite moderated reactors.

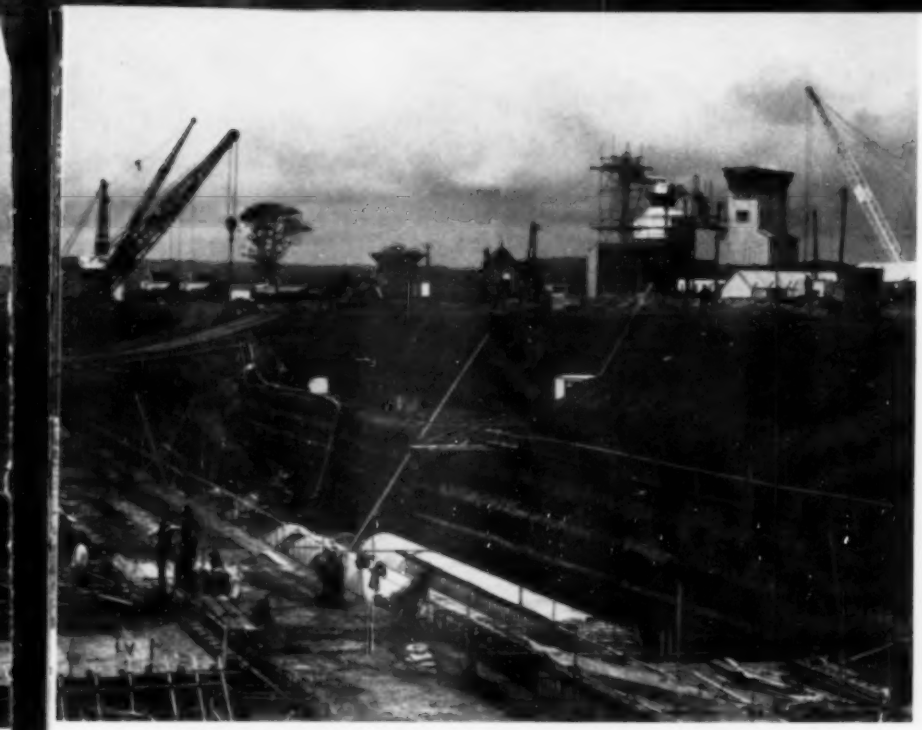
Carbon dioxide will transfer the heat from the reactors to the boilers. Circulation of the gas will be effected by single-stage axial blowers operating at 2,575 rpm. The blowers will be driven by 3,800-hp AC induction motors.

Install Wellpoints

A feature of the Berkeley station is the fact that it has been located on the flood plain of the Severn. In order to lower the naturally high water table, the excavations have been surrounded by a wellpoint system consisting of submersible electric pumps located in 6-in. and 10-in. tube wells. Over 250,000 cubic yards of hardcore fill have been brought to the site to raise the general level. The spoil from excavations was also used as fill.

Laying this hardcore to a depth of up to 12 feet around the excavation area and compacting it to form roads and foundations of temporary buildings, such as workshops, offices and camps, was as-

A 165-ft. tall Monotower crane erects thermal shield around which a biological shield will be built. Second crane is unfinished.



While excavation of turbine hall site continues at left, a Balfour Beatty & Co. crane prepares to lay 81-in. diameter sections of concrete pipe which will bring in water.

signed to Vickers Vigors 180-bhp bulldozers fitted with a cable-operated blade. At the height of the operation, when some 4,000 tons per day were being laid, a Fowler Challenger Mark 3 and five International TD-24's were also in operation. Three of the latter were equipped with pusher blades and two with winch-operated blades. Compaction of the hardcore was handled by Wallis and Steevens Advance rollers.

The main excavations for the reactors were carried out by John Laing using a fleet of 22 15-ton Euclids, loaded by four Ruston-Bucyrus 43-RB shovels, an 802 Lima dragline and a 38-RB dragline.

About 165,000 cubic yards of clay and tough red marl were excavated from the two reactor pits which were 30 feet deep and 300 feet in diameter. The 15-ton Euclid model used by John Laing is powered by a Rolls Royce C6 NFL diesel developing 200 bhp at 2,000 rpm.

At the same time, Balfour Beatty, the contractor responsible for the turbine hall construction, began excavation and preliminary work for the cooling water system. The excavation for the turbine hall occupies an area of approximately 500 x 100 feet and has a maximum depth of 45 feet. The total quantity of material removed was about 95,000 yards. Two Newton Chambers model 605 excavators carrying 1½-yd. dippers were used for excavating this spoil, and it was carried to dump sites by a fleet of 9-yd. Scammel four-wheel drive dump trucks. Other equipment included Ruston-Bucyrus 19-RB and 22-RB excavators and a fleet of Aveling Barford shuttle dumpers of 4½-yd. capacity.

A Ruston-Bucyrus ¾-yd. 22-RB dragline was one of numerous excavators on job.

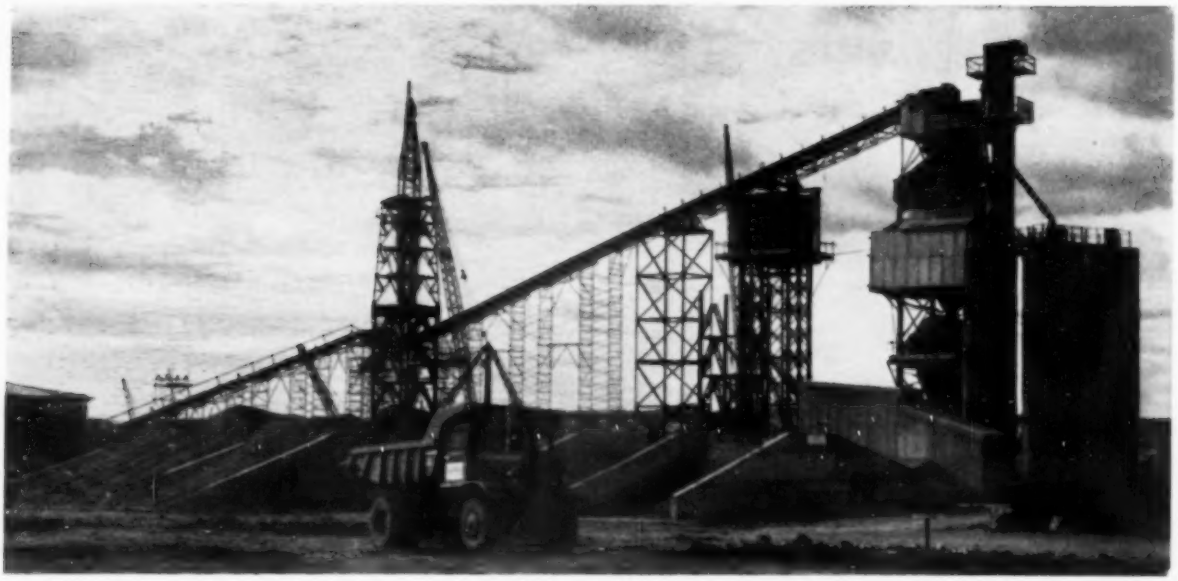
While excavation was going on, the erection of the reactor vessel assembly shop by John Laing was also in progress. The first stage involving compaction of six feet of hardcore and the laying of a reinforced concrete slab and access road was completed in five weeks. This enabled welding of the pressure vessel bottom dome to proceed while the housing was being constructed to take the vessel.

Both contractors have erected substantial weigh batching plants to provide the large amount of the concrete required. The setup operated by John Laing is situated midway between the two reactors and has been supplied by Winget Ltd.

Batch Plant Design

In this plant, a 150-yd. capacity bin with a central cement compartment holding 29 tons of cement is split into two compartments to accommodate the two different types of cement used. Below the bin are two cement weigh hoppers with a capacity of up to 2,000 pounds each; two aggregate weigh hoppers of 9,000-lb. capacity; and one water batch weigher of 1,000-lb. capacity. An admix batcher of 5-lb. capacity is also included. All these units are provided with separate scale mechanisms.

Charge and discharge of all the batch weighers is performed by air rams con-



Here is the Winget weigh batching plant set up by John Laing & Son to supply concrete at the rate of 60 cubic yards per hour.

trolled from a central control panel situated on an operator's platform. This central panel also incorporates controls for the charge and discharge of the two mixers. One operator supervises the batching and mixing of concrete in this panel. The batched material is collected by a cone which delivers through a pneumatically-operated chute into two 56 T-type Winget-Kochring Tilt-mixers. Below the mixers is a two-compartment wet concrete hopper arranged to receive feed from the mixers either singly or jointly. Concrete can be discharged from the hopper to a reversible conveyor or directly into dumpers.

Aggregate is delivered to the main plant by a belt conveyor which delivers materials into a rotating distributor fitted at the head of the plant. This takes the material from the conveyor and delivers it into any of five compartments as desired.

Silo Storage System

Winget has also provided a group of four bulk cement storage silos, each having a capacity of 125 tons, which are charged from a 15-ton ground receiving hopper accepting any type of delivery vehicle. This is conveyed to a totally enclosed elevator which in turn delivers, by changeover valves, into the two compartments of the main bin central compartment, or into any of the four ground storage silos. The cement system is so arranged that to replenish the center compartment, any silo can, by air float, deliver back to the main supply elevator, forming a recirculation system to keep the center compartment topped up to give full operation requirements.

The output of pumped concrete is through 6-in. diameter pipes. Maximum capacity is 60 cubic yards per hour. The Balfour Beatty firm has provided a similar cement bulk plant feeding 21-yd. Stothert & Pitt mixers, which in turn supply two 6-in. diameter concrete pumps.

When the project has been completed, both plants will have used a total of over 70,000 tons of cement.

In the construction of the biological shields the concrete will be discharged in skips for mechanical placing and vibrating. Vibration of the concrete is done by Consolidated Pneumatic type CP 325 vibrators.

Erection of the pressure vessel at Berkeley is taking place simultaneously with the structural work. The bottom dome of the pressure vessel is being welded on a temporary fabrication slab adjacent to its permanent site. On completion, the 180-ton dome will be run into position on heavy bogies. Although the completed vessel will have a weight of some 1,500 tons, a dead lift of 15 tons will be the maximum to be lifted during the course of construction. To deal with lifts up to this weight, two Monotower cranes are being constructed at each reactor. Height from the ground of the assembled units will be 165 feet.

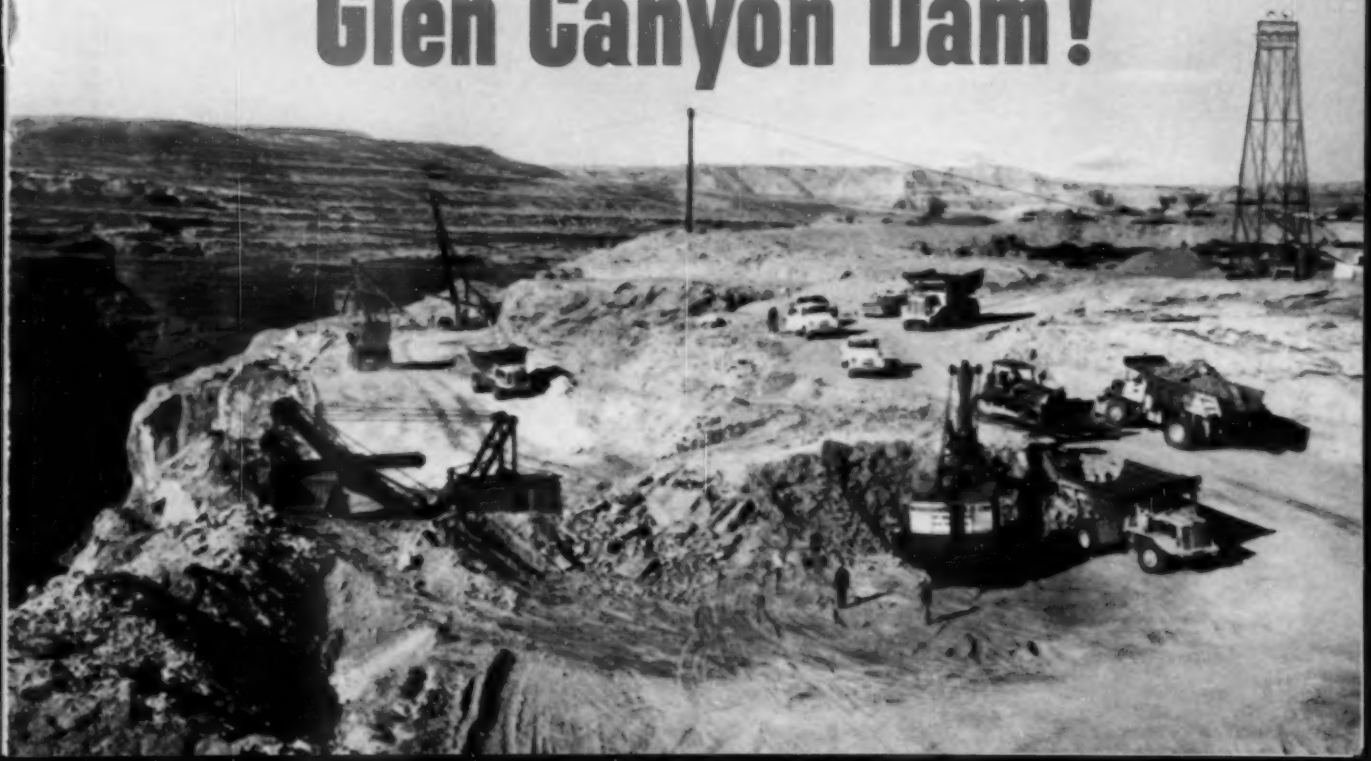
Cooling water for the turbine hall will be drawn from the Severn through two tunnels leading from a point some 650 feet offshore. Discharge of the warm water from the turbine hall will be through four 81-in. diameter concrete pipe culverts located upstream from the intake and emerging close to the bank. To prevent re-entry of the warmer water, a baffle wall some 1,500 feet long is being constructed from box piles. The piles are being driven by McKiernan-Terry 10B3 double-acting steam hammers and a Delmag model D22 pile driving hammer.

The water tunnels connecting the intake to the pumphouse are 9 feet 6 inches in diameter and will be formed by precast concrete segments. The driving of the tunnels will be started from headshafts driven close to the bank of the river Severn.

Allied to the rapid construction schedule are a number of considerations not normally attached to conventional power stations. Foremost among these are the absolute intolerance of constructional errors; the high degree of precision work required; and the co-ordinated construction not only in civil engineering, but also in the electrical and mechanical installations. The heavy capital outlay involved (roughly estimated at $100 million) requires a minimum of construction time, to which is added the United Kingdom's pressing need for supplementary sources of power.

Operation of the first reactor at Berkeley is scheduled for 1960 and the second is expected to be in commission in 1961. On completion, both reactors will have an estimated output of 275 MW, representing an equivalent value of over 1 million tons of coal yearly.

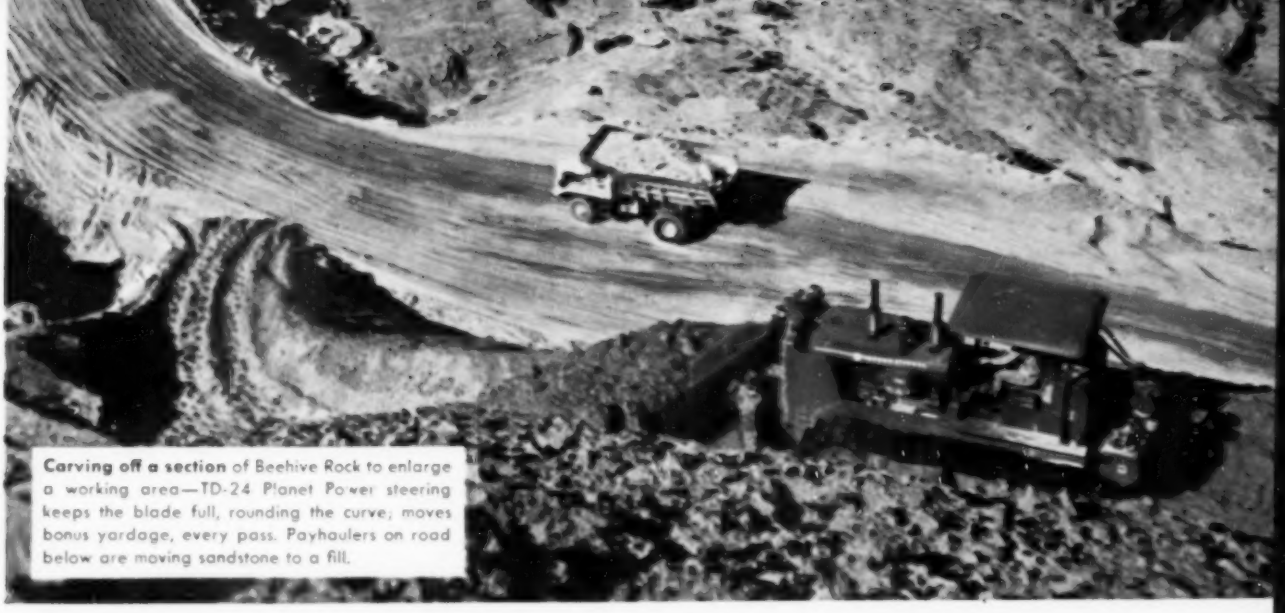
Merritt-Chapman & Scott mobilizes International® fleet to build colossal Glen Canyon Dam!



Noon time is inspection time as Merritt maintenance men, using International welder and shop trucks, roll up to Marion power shovel for fast, on-the-job service.

$108 million contract crawlers, haulers,

"95" Payhauler fleets keep busy on both sides of the 700-foot-deep canyon. These three units are hauling shovel-loaded rock from spillway excavation on the huge Glen Canyon Dam project.



Carving off a section of Beehive Rock to enlarge a working area—TD-24 Planet Power steering keeps the blade full, rounding the curve; moves bonus yardage, every pass. Payhaulers on road below are moving sandstone to a fill.

rolls on schedule with International® trucks and service!

MERRITT-CHAPMAN & SCOTT CORPORATION is shooting to complete its $108,000,000 Glen Canyon Dam contract—biggest competitively bid job ever awarded to a single contractor—well ahead of the specified seven-year limit. A big fleet of International equipment helps keep this huge Bureau of Reclamation project on the Colorado River in Northern Arizona rolling at record pace.

Planet Power-steered TD-24 crawlers prove the worth of full-time live power on both tracks—blading bonus loads 'round the curves. Grade-beating "95's" high-balling rock show why a load-and-road-matched Payhauler® fleet—bonus-powered with turbo-charged diesel engines—belong on this tough, high-altitude job. International trucks are here, there, and everywhere—handling a multitude of different material, equipment, and personnel-carrying assignments.

And complete International parts and service is minutes close to insure high performance availability of every International machine.

8-passenger International Travelall, with hill-climbing four-wheel-drive, transports engineers and surveying equipment over rough terrain right to the dam site.

Here a rugged International truck with boom rig is used by electrical linemen to set up important transmission lines on the east side of the Colorado River.

Making ready for power. Conventional International truck with engine-driven auger sinks holes for transmission lines.

On-the-spot maintenance. International shop truck moves in as shovel takes "fuel break" from International cab-forward tanker.

Big capacity. Six-wheel heavy-duty International truck with 5,000-gallon tank sprinkles water for compaction of road base.

Ready for any emergency. Merritt medical crews use International Travelall ambulances, complete with oxygen and first aid equipment, to provide mobile first aid. One stands by on each side of the river.

Track-roller lubrication of the TD-24's only needs to be done each 500 working hours. A cab-forward International truck, provides an efficient, mobile "service station." This compact International was chosen for exceptional maneuverability.

Prompt, performance-backing International service ... company and distributor ... *keeps 'em rolling!*

The complete service resources for which International is world-famous are on the job for Merritt-Chapman & Scott—to help keep all International equipment rolling and producing!

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Pipeliners Push Through Minnesota Wetlands

Superintendent A. A. Carrigan and Bud Heyensel, timekeeper, attend to paperwork in office of the spread near Bemidji, Minn. Carrigan has been with Fulton for 18 years.

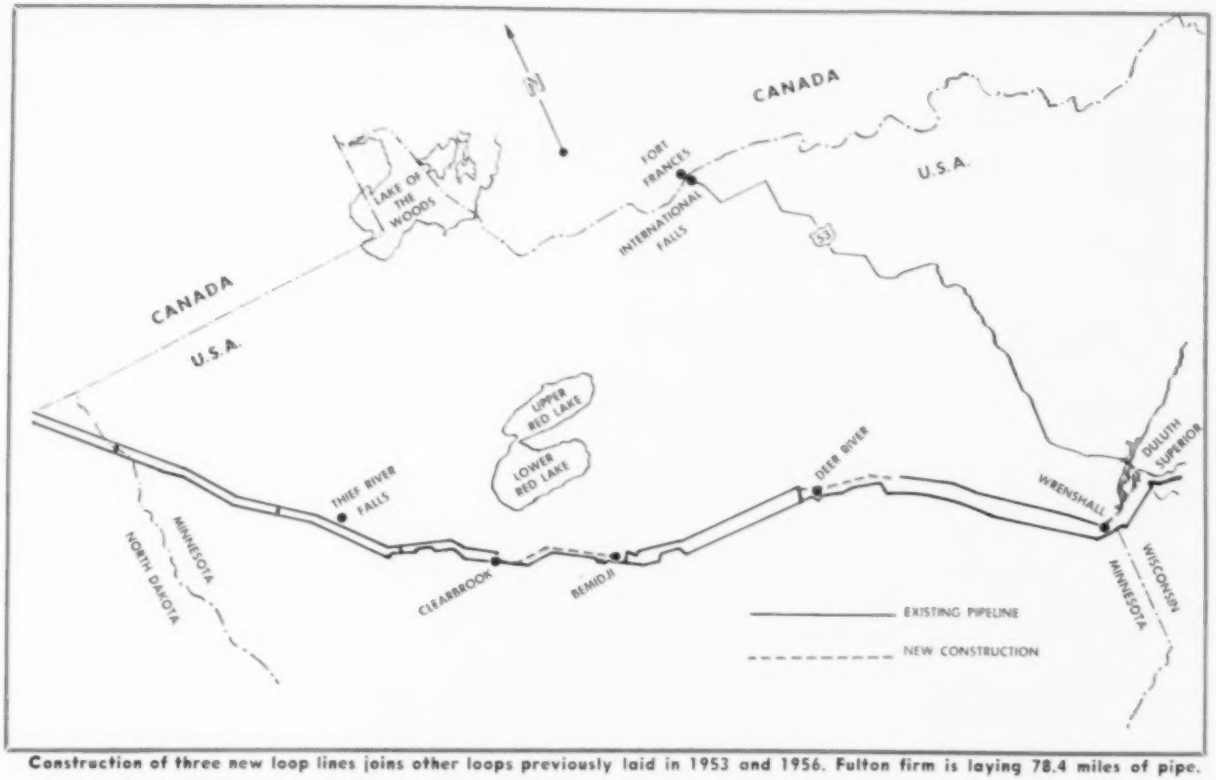
Texas firm gets a good dose of North muskeg country laying 78 miles of oil loop lines.

WATER, water and more water. Ever since he completed a pipelaying job in north central Minnesota last year, A. A. Carrigan, 43-year old field superintendent for pipeline contractor R. H. Fulton, of Lubbock, Tex., probably has been having nightmares in which water dominates the nocturnal scene.

Carrigan, a native of Texas and a veteran of 17 years of laying pipe in many sections of the United States, says the Minnesota job was the toughest job he ever bossed because of the water problem. Besides a naturally high water table level, a summer of heavy rain added to the mud and generally helped bog down the advance of the pipeliners.

The job involved laying three loop lines, consisting of 78.4 miles of 26-in. pipe, for crude oil transmission. It passed through a variety of terrain which, besides common swamplands, included peat moss, quicksand, muskeg and brown rock—tough, slow going all the way.

The three loop lines completed this year joined loops previously laid in 1953 and 1956. The work started at Superior, Wis., early last year and worked west. The first loop of 18.5 miles ran from Superior to Wrenshall, Minn.; the second loop, a 25.5-mile stretch, started



Construction of three new loop lines joins other loops previously laid in 1953 and 1956. Fulton firm is laying 78.4 miles of pipe.

Welding crew working with tractor-mounted 250-amp Lincoln welders join pipe. Water-filled ditch is common sight on the job.

at a point near Blackberry and terminated near Deer River; the 34.4-mile third loop started near Bemidji and ended at the Clear Brook (Minn.) pump station. The lines are owned by Lakehead Pipeline Co., Inc., a subsidiary of Interprovincial Pipeline Co., Edmonton, Alta.

This new 26-in. pipeline parallels an 18-in. line placed in 1950. Addition of the 26-in. pipe to the transmission system means that the flow of crude oil from its shipping point near Edmonton in Alberta can be considerably stepped up. Previously, the flow through the 18-in. line was slowed because the viscosity of the large volume of oil flowing through the pipe created friction. This hindrance will largely be eliminated by diverting the oil into the 26-in. line and thus making use of the two lines instead of only one. The new high pressure line has oil moving through at about 800 psi. To keep the oil moving at a brisk pace, pumping stations are located at intervals of about 100 miles.

The crude oil is coming from three main fields in Alberta, all in a 100-mile radius of Edmonton. They are Le Duc, Redwater and Fosterton fields.

From Alberta the crude is pumped down through North Dakota, Minnesota, northwestern Wisconsin, and into upper and lower Michigan. It leaves Michigan through Port Huron and is pumped into the large refineries located in Sarnia, Ont. Very little of the total amount of crude is tapped from the line for use in the United States. The large refinery at Sarnia converts the crude to gasoline, diesel fuels, kerosene, distillates and other petroleum products needed and used in the Canadian market. A pipeline connecting Sarnia with Toronto is now being built.

Completion of the entire far-flung line will mean an end to the present oil-barge shipping across Lake Superior and Lake Huron for the Lakehead Pipeline Co., since the company will be able to reach its eastern Canadian markets directly by pipeline. It will make possible a huge saving in both time and money in getting the oil from the producing well sites to the markets. Ultimate capacity of the line will be 300,000 barrels a day.

Field Superintendent Carrigan was born in Haskell, a small town about 160 miles west of Forth Worth 43 years ago, but now calls Fort Worth his home. He has worked for R. H. Fulton since 1940 and has bossed some of the company's biggest jobs.

Recalls Tough Jobs

Among the tough jobs he likes to recall are a 30-in. natural gas line from Corona to Gallup, N. M.; a 26-in. gas line from Grand Junction to Rangely, Colo.; and a 22-in. gas line from Green River to Laramie, Wyo.

"These were tough jobs," he said, "but this Minnesota job takes the cake. This country is so swampy and wet we were getting stuck in the mud almost every day. Minnesota's automobile license plates bear the inscription '10,000 Lakes' and sometimes I think we ran into most of them on this job."

Early last year, advance crews with two Cat D7 dozers working under the direction of Pete Hines started the work of clearing the right-of-way for the Fulton spread. Some tree cutting and brush burning was required because the

Seven brand new Bucyrus-Erie 15-B hoes, purchased especially for pipeline, arrive at railroad siding near Superior, Wis.

underbrush grows thick in the northern swamp country.

Following close behind the right-of-way clearing, trenching equipment moved in. Seven Bucyrus-Erie ½-yd. 15-B hoes, three ¾-yd. 22-B hoes, a Northwest 25 clam and a Cleveland model 320 ditching machine were used. All seven 15-B's were purchased new by Fulton from Browning-Ferris Machinery Co. at Lubbock, Tex. They were powered by Cat D315 diesel engines and equipped with tractor-type crawlers for extra traction and ground clearance. A Crose boring machine was used to put the pipe under railroads and highways. Clint Schell was foreman of the ditching crews.

Carrigan estimated the crews ditched about 6,000 feet every day. No shooting was required in this soft terrain and Carrigan considers himself fortunate that it wasn't. It would have been mighty risky business to shoot because the new pipe was laid within 10 feet of the existing parallel 18-in. line, which was carrying a full load of oil.

The 26-in. pipe sections, made by A. O. Smith Co., Milwaukee, Wis., were rolled in 40-ft. joints. It had a sidewall of $^{9}/_{32}$-in. thickness. A 30-in. Smith casing was used for laying the pipe under railroad tracks and highways. The pipe was shipped by rail via the Soo, Great Northern and Northern Pacific railroads.

A truck-mounted Northwest 25 crane unloaded the pipe at various rail sidings along the way. The pipe was then transported from the rail points to the trench by a fleet of LaCrosse trailers pulled by Ford F-750 tractors.

Approximately 250 men were employed by Fulton on this job. Two large army surplus Ford buses, seating about 50 men each, were used to transport the men back into the rough country where the pipe was being laid.

Stringing work was done by two D7 tow tractors, three D6 sidebooms and a Northwest 25 crane. A CRC (Crutcher-Rolfs-Cummings) bending machine with the assistance of a D7 sideboom was used to bend the pipe.

The pipe gang, under the direction of Jack Fraley, worked with two Crose self-powered buffing units, a D6 with two 250-amp Lincoln welders and two D7 sidebooms.

Bobby Dodd's welding crew was equipped to do business with an Inter-

End of section is beveled by the pipe gang using a Crose 200A bevel machine. After the cutting is finished, the short plug end lying on ground will be attached for testing.

Three ½-yd. hoes—one in foreground and two in background—ditch through soft, unstable material. Seven 15-B's were on job.

national TD-18 tractor carrying four 250-amp Lincoln welders; nine 250-amp Lincoln welders mounted on sleds; and two D7 tow tractors. Fleetweld #5 rod in $^{5}/_{32}$-in. thickness was applied for the stringer bead. Shield Arc 85 was used for the hot pass, cap and filler welds. The welds were checked by X-raying periodically. However, most of the tie-in welds were X-rayed. The pictures were developed at the site and read within 15 minutes after being taken.

At a railroad crossing, the pipe trench is widened by a Northwest 25 clamshell to permit crews to bore a hole under the rail bed. Crane carries a 1-yd. bucket.

Coat Pipe

After the welders finished, the dope gang moved in with their equipment to get the pipe ready for lowering-in. The equipment included four Littleford Brothers track-mounted 10-barrel dope pots; three D7 sidebooms; a D7 dozer; D7 and TD-14 tow tractors; a Perrault cleaning machine; a Crose dope machine; and an Athey wagon used to haul the doping paper.

According to dope gang foreman Sam Tune, a coating of coal tar primer and enamel was applied after the pipe was cleaned. This was followed by a wrapping of woven glass reinforcement and asbestos felt. The joints were then ready for welding.

A spark detector crew, using an electrical jeeping machine, checked the protective coating. The jeeping device was spring-mounted to the pipe and was hooked up to batteries. Current was sent through the device and, as it slid over the pipe, it flashed or "jeeped" if the coating was too thin. Spacers were put on the pipe to keep it from rubbing against the casing when the pipe was laid in holes bored under railroads or highways. The spacers minimized cathodic action on the pipe.

As lowering-in of a section of the 26-in. diameter pipe begins, three Cat D7 sideboom tractors maneuver into position. Right-of-way has been cut through thick forest.

The lowering-in crew, bossed by Ernie Blachly, worked their equipment in teams to get the pipe into the big ditch. Probably the most important pieces of equipment to the lowering-in crew were the one 6-in. and three 4-in. Jaeger water pumps used to dry up the ditch of the seemingly ever-present water. The pumps got an exceptionally good workout on this job, according to Blachly.

For the actual lowering-in of the pipe, the crew used four Caterpillar D7 sidebooms, a Northwest 1-yd. clam machine and a Bucyrus-Erie 15-B clamshell. The Littleford 10-barrel track-mounted dope pot, towed by a D7 sideboom, was used to patch up any damaged pipe they came across.

Backfill operations were handled by a 15-B and 22-B clam and a tractor equipped with a Cleveland model 190 backfiller. The pipe rested on a bed of a minimum of four inches of loose dirt and was covered by 36 inches of backfill. When the backfill machines finished, the terrain was restored to its original condition. An important phase of the clean-up work was the restringing of fences and restoring of farmlands which were torn down to allow the pipe laying crews to get through. Pete Hines was in charge of Fulton's clean-up operations.

The servicing and repair of the equipment used on the spread was under the supervision of Master Mechanic R. V. Jackson.

Other Fulton personnel included W. E. Cohoon, assistant superintendent; Hank Hensley, boring foreman; and Douglas Haynes, bending foreman.

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BEST BUY IN NEW AND USED EQUIPMENT

News from the Field

AGC Elects Officers

The three occupational divisions of the Associated General Contractors of America named officers for the coming year at the AGC's recent 39th annual convention held at the Statler-Hilton Hotel, Dallas, Tex.

Elected chairman of the building contractors' division was Ira H. Hardin, Ira H. Hardin Co., Atlanta, Ga. He succeeded Charles B. Solomon, George B. H. Macomber Co., Boston, Mass. Robert W. Long, Long Construction Co., Kansas City, Mo., was named vice chairman.

Max C. Harrison, Harrison Construction Co., Pittsburgh, Pa., was selected chairman of the highway contractors' division, succeeding W. Ray Rogers, Rogers Construction Co., Portland, Ore. The new vice chairman is J. P. Gibbons, Gibbons & Reed Co., Salt Lake City, Utah.

Elected head of the heavy construction and railroad contractors' division was Charles L. Harney, Charles L. Harney, Inc., San Francisco, Calif., succeeding Robert M. Hoover, Kansas City Bridge Co., Kansas City. Howard H. Sturdy, Dravo Corp., Pittsburgh, Pa., was named vice chairman.

M-K Receives Safety Awards

An outstanding safety record on the Dwight D. Eisenhower Lock section of the St. Lawrence Seaway project was the occasion for a dinner at Massena, N. Y., honoring Morrison-Knudsen Co., Inc., Boise, Idaho, sponsoring contractor on the job. Morrison-Knudsen received the award of honor of the National Safety Council and another top safety award from its insurer, Employers Mutuals of Wausau, Wis., which insures 90% of the Seaway projects on the American side.

The accident frequency rate on the Eisenhower Lock was more than 80% below the heavy construction industry average during 1957, in which nearly two million man-hours were worked. In two years of work on the lock, there has been only one fatality.

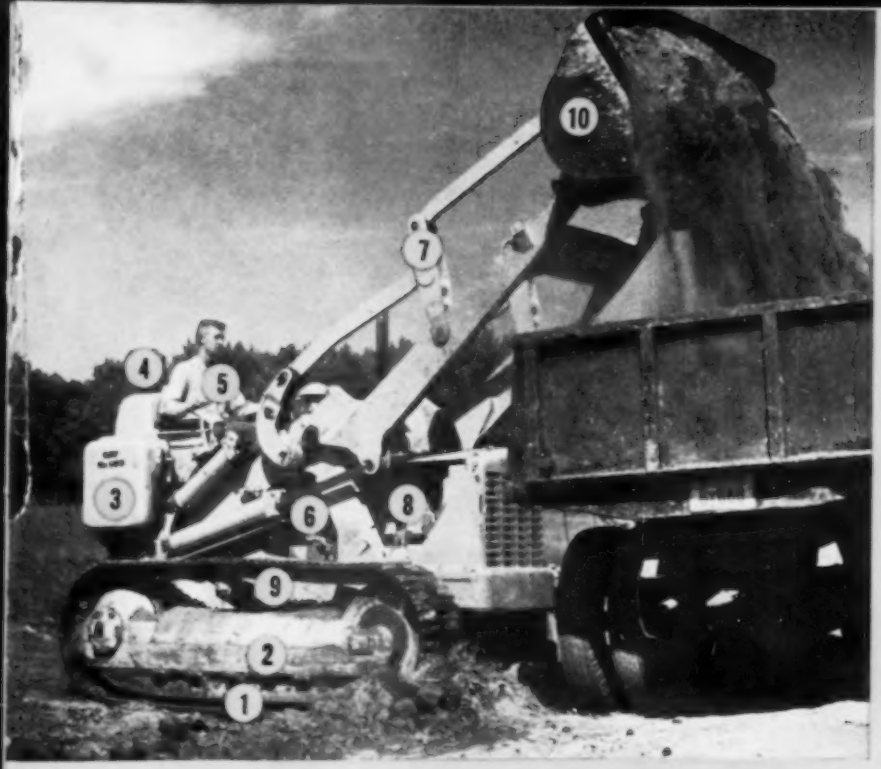
The same two awards were presented in May 1957 to the Perini Corp., Framingham, Mass., for its excellent safety record as sponsoring contractor on the Grasse River Lock. It is expected that the entire Seaway project will be completed with one of the best safety records in the history of heavy construction.

Interstate System to Total 38,548 Miles

Reports from 48 states and the District of Columbia show the new interstate system of highways will total exactly 38,548 miles, G. M. Williams,

Continued on page 48

From left are Richard Daley, M-K safety engineer; C. A. McGinnis, accident prevention manager for Employers Mutuals; F. W. Braun, vice president, Employers Mutuals; John Armitage, M-K project manager, holding National Safety Council award; Supt. Ed Eaton, holding Employers Mutuals award; and Jack Williams, director of safety.



Caterpillar No. 955 Traxcavator works 10 hr. a day loading sandy loam into 6-yd. trucks for Brookings Excavating Co., Brookings, S. D. Two blocks of a street on the outskirts of town are being widened. Traxcavator is leveling bank. "One of the features we like best about it," says owner Lyle Stewart, "is the 40-degree tilt-back. It's especially useful tearing up old roads and sidewalks. You can get the bucket under a slab and use the tilt-back to tear up larger slabs at a time." This No. 955 is used for backfilling, too, and for digging basements, as well as for finish grading.

NOW AVAILABLE! NEW SIDE DUMP BUCKET!

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5 Learn how convenient the *one-hand lift and bucket control levers* are.

6 Start the *all-weather gasoline starting engine*—so easy from the operator's seat.

7 Examine the *lift and bucket control arm linkage*—permits *40° tilt-back* at ground level.

8 Get the whole quality story behind the *CAT 70 HP Diesel Engine.*

9 Hear the amazing economy and convenience facts behind the *exclusive oil clutch.*

10 Watch the big 1½-*cu.-yd. bucket* in action (it's the widest part of the machine).

And this is *only the beginning* of your demonstration. Call your Caterpillar Dealer today.

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News . . .

Continued from page 46

assistant commissioner for engineering, Bureau of Public Roads, Washington, D. C., recently told an engineering group convention in Chicago, Ill.

Appearing before a highway division session of the American Society of Civil Engineers, Williams said that the reports had been analyzed and checked, and that the Bureau of Public Roads has placed all data on computer cards for preparation of statistical reports.

"These reports are in readiness for consideration by Congress, but have not been distributed to the general public," he said.

The data shows that the highway network will include 33,980 miles of rural roads and 4,568 miles of urban roads. Of these, 36,406 miles will be free of tolls and 2,142 miles on which tolls will be charged.

The total cost will be $39.5 billion, with the urban roads costing $22.3 billion and the rural roads $17.2 billion.

Four-lane highways will be predominate in the new system, a total of 32,173 miles, or 83½% of the network. Only 1,856 miles will be two-lane roads. There will be 3,251 miles of six-lane highways, and 1,202 miles of eight-lane roads. Highways with 10 or more lanes will total 66 miles.

Williams also revealed these figures for the road system, but for rural areas only:

Bridges over 1,000 feet total length	220
Bridges less than 1,000 feet total length	6,765
Interchanges	8,763
Highway separations	9,546
Railroad separations	1,452
Highway-railroad separations	405
Tunnels more than 500 feet total length	20

He said that the state highway departments and the Bureau of Public Roads have already submitted an engineering consultant's report to Congress.

"More than 1,200,000 man hours of effort are estimated as having been devoted to this report," he said. "It has been prepared in much the same detail as are reconnaissance reports for budget and construction scheduling operations.

"The work as estimated is in accordance with the approved standards, and where standards higher than the minimums have been used, they are not of a range that would result in excessive cost."

Williams said that it was hoped that the rate of construction in the states would be uniform, and that work may proceed in an orderly manner.

"The estimates have been submitted to Congress with recommendations that they be approved as basis for apportioning interstate funds for the three fiscal years, 1960-1961-1962," he said.

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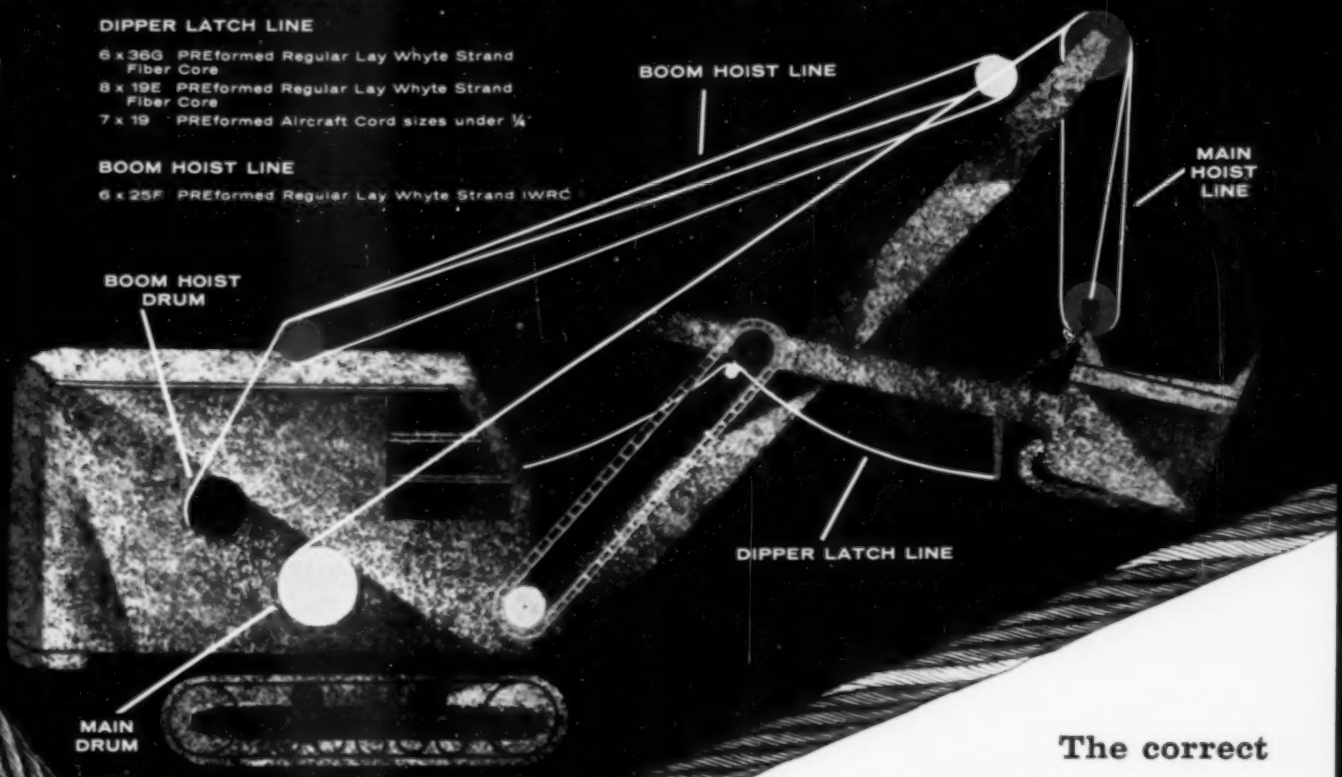
*Where sheaves or drum diameters are less than 22 times rope diameter.



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In addition, every inch of Whyte Strand wire rope is internally lubricated. As the rope flexes, this enables adjoining wires to move by each other without wear, and extends the life of the rope. The tenacious lubricant also protects the exterior strands against moisture and corrosion.

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CAT Engines are economical to operate. They start easily and stand up under the roughest going. The special metals and superior workmanship which go into their manufacture mean negligible down time, and this in turn means that your other equipment on the job won't be idled because a key machine has to be repaired. That's why you often see reliably rated Cat power units widely used on a single job—powering a combination of cranes, ditchers, cement batchers, auxiliary lighting—the works. And for the same profit-making reasons, you find a growing preference on the part of the job-wise contractor for Cat Engines to *repower* equipment that's short on day-in day-out guts.

Developed as the first tractor-diesel engine, these same basic characteristics—from smooth lugging without fouling to the ability to idle for long periods—make Cat Engines of today first choice to power and repower the contractor's valuable equipment. Particular attention is always paid to durability, a trouble-free fuel injection system able to handle a wide range of fuel, and to maximum protection for its fuel, air, oil and water.

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Engine Division, Caterpillar Tractor Co., Peoria, Illinois, U. S. A. Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

A dependable Cat D318 Engine furnishes power for the operation of this Parsons trencher, and a pair of D311s work the Insley cranes in the background. The Mainland Construction Co. of Texas City, Texas, is handling this new housing project, and Clyde E. Smith, partner, says, "We can bid the jobs cheaper when we have good equipment that gets the job done. During the five years we have been in business we have never lost an hour's time due to failure of Cat-built equipment!"

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C. J. Langenfelder & Son, Inc., relies on a heavy-duty Cat D397 Engine to power this Lima shovel, loading out slag material for use on runway extension and widening job at Middletown Air Depot, Middletown, Pa. Cat DW20s and a Cat D8 Tractor are also on the job. This spread's Equipment Superintendent, LeRoy A. Marquis, says, "You can't beat Caterpillar power — economical to operate, low in down time, dependable to the nth degree!"

Construction is under way on a canal 85 feet wide and 9 miles long through a 1,200-lot subdivision. This pleasure boat waterway is being constructed with 2 Bucyrus-Erie 15-B draglines powered by Cat D315 Engines. Owner Cuyler L. Lanier of Tavares, Florida, says, "Cat Engines and equipment turn out more work and are more economical to operate than similar machines."

Russ Mitchell, Inc., of Houston, Texas, repowered this Austin ditcher with a Cat D13000; and a Koehring clamshell on the job is powered by a D318. Job is trench work for a storm sewer. Said E. C. Cowart, Job Superintendent, "For my money Cat makes the best equipment in the dirt-moving business. I like the dependability of their engines when the going is tough!"

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The revolutionary Arcair process for metal removal has proved highly effective on dipper tooth preparation for repointing and other maintenance on heavy earth-moving machinery.

FAST, LOW-COST REMOVAL

The job shown above is a typical application. The Arcair Model H-3 Torch was clocked repeatedly at two minutes per tooth for removing stainless welds on worn repoints. About $\frac{1}{3}$ of a $\frac{1}{4}$" Arcair Copperclad electrode was consumed, at a total cost of 3 cents.

Similar tests with comparable results have been made on a variety of earth-moving equipment—dozer blades, buckets, pads, sprockets, idlers, rollers, tractor grousers, cast iron housings, crusher jaws, gyrator cones and concaves, crusher rolls, etc.

PROCESS DETAILS

The Arcair Torch uses ordinary compressed air at 80-100 psi and current from any D.C. welding machine with Arcair Copperclad electrodes. The electric arc causes the metal to melt, and an air jet paralleling the electrode blasts the molten metal aside.

The process can be used on any metal, and is particularly effective on stainless steel, manganese steel, hard-surfacing alloys, cast iron and copper alloys. Cast iron and copper alloys, however, should be worked with A.C. current.

Because it does not depend on oxidation, Arcair cuts stainless and manganese as easily as mild steel. The Arcair process introduces less heat than any of the welding processes so that the physical properties of such materials as manganese steel are fully preserved.

INFORMATION AVAILABLE

For complete information or practical demonstration, contact your local welding supply distributor or write Arcair today.

Arcair COMPANY

458 S. Mt. Pleasant St., Lancaster, Ohio

Equipment You Ought to Know About

50-Ton Tractor-Trailer

Manufacturer: Autocar Div., Department EE, White Motor Co., Exton, Pa.

Claims: A new planetary-axle tractor and a matched bottom-dump trailer with rated capacity of 50 tons have been developed by Autocar for off-highway use in coal hauling operations.

The tractor, designated the AP-25T, takes advantage of the engineering features of the AP-25 truck adapted to tractor-and-trailer design.

The AP-25T tractor, linked to the trailer by means of a newly developed, fully universal hitch assembly, is powered by either a 335 or 375-hp turbo-diesel engine. The specially designed bottom-dump trailer is rated at a capacity of 61 cubic yards struck or 69 cubic yards heaped (3 on 1 slope).

The tractor and single-axle trailer units are matched to assure top performance and ease of maintenance in rugged operations.

Such components as the rear springs and brackets, the brakes, wheel bearings and all outer-end parts of the tractor's drive axle are interchangeable with comparable parts from the trailer.

Total length of the combined units is 53 feet 4 inches. Overall width is 11 feet $8\frac{5}{8}$ inches. Loading height is 11 feet from the ground.

Engine units include standard 335-hp Cummins NRTO and optional 375-hp Cummins NFT diesel engines. Both have piston displacements of 743 cubic inches. The NRTO delivers a maximum torque-horsepower of 900 at 1,500 rpm; the NFT, 942 at 1,600 rpm.

The AP-25T tractor is equipped with a nine-speed heavy-duty, close-space, progressive-shift transmission. The tractor also is available with optional single-stage, four-element torque converter and a constant-mesh planetary transmission with four speeds forward and two reverse speeds. These latter components enable the driver to maintain momentum by permitting him to shift gears under full power.

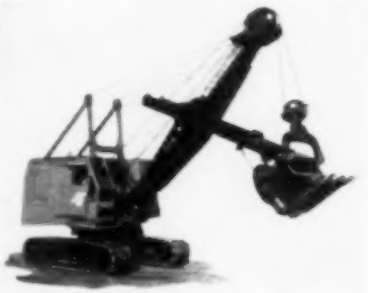
The planetary rear axle, available with total ratios of 15.96 or 17.49 to one, has wheel-bearing capacity ratings of 45,200 pounds radial and 29,600 pounds thrust per wheel at 500 rpm.

Built to withstand severe torsional loads common in off-highway operations, the frame of the tractor is an all-welded box section of $\frac{3}{8}$-in. carbon steel.

Two heavy steel clamshell doors operate by compressed air to dump the payload from the bottom of the trailer.

Rolling on cast-steel wheels, the two front tires of the tractor are size 14:00 x 25, 20-ply, while the tires on the rear of the tractor and on the trailer are 18:00 x 25, 28-ply.

3-Yd. Shovel



Manufacturer: Manitowoc Engineering Corp., Manitowoc, Wis.

Claims: Manitowoc has added a new 3-yd. model to its excavator line. Basically a shovel, the new model 3600 is also convertible to crane, clamshell and dragline applications.

The new Manitowoc has a three-stage torque converter coupled to an engine equipped with the Manitowoc "torque limiting tail shaft governor." This combination allows the machine to take full advantage of the reserve of power available through torque conversion, yet takes responsibility for restraint of torque wherever it could be harmful to the excavator.

The model 3600 contains just 14

gears in the entire machine—with the gears turning only when working—to reduce power loss. This is accomplished with a slide pinion arrangement which directs power straight to the operating function. Easy operating air controls are available for every operating function including steering.

Designed as a "working partner" with other machinery used on today's construction projects, the boom, sticks and shipper shaft of the 3600 are so tough that there is no need to "baby" the front end and the dipper will not twist away or glance off exceptionally tough digging areas. The shipper shaft is positioned at an ideal location on the boom so that the machine can achieve working ranges tuned to modern construction practices and the size and shape of modern hauling units.

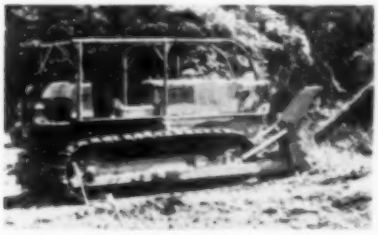
Outstanding mobility between jobs and on the job is aided by self-removing counterweight for easier between-job shipment or trailering without exceeding highway weight restrictions. A low overhead clearance of only 14 feet 6½ inches is possible because the gantry folds down flat on the cab, while the boom stretches out straight ahead.

The new unit has a rugged, "closed-face" box design tread which is self-cleaning. With this tread construction plus direct power flow to the travel gears, the 3600 will climb 30% grades over any terrain.

Land Clearing Tool

Manufacturer: Rome Plow Co., Department EE, Cedartown, Ga.

Claims: The new Rome K G blade shears off tree stumps cleanly at ground level or below. It is designed for clearing reservoirs and lakesites, right-of-ways and rangelands and for building woods roads, fire breaks and drainage ditches. A quick adjustment on the tool permits complete removal of stumps and root systems below ground level.



The blade cuts and windrows a wide swath of small to medium size trees in one continuous pass. Larger trees are cut individually. An important advantage is that it can cut exceptionally

Continued on page 57

Weight concentration in the lower center section eliminates top heaviness. Combined with 6 part block and tackle reeving, it gives OWEN Buckets that extra power to dig in at the beginning — and to continue to dig with equal force on both jaws during the entire closing cycle. At the end of the stroke, there is no power loss and lifting tendency is at a minimum.

Other features that make OWEN the leading clamshell "seller" are:

One-piece Head Construction

Riveted Bowl Construction

Single Main Shaft

Recessed Lip Design

On this our 50th Anniversary Year, The Owen Bucket Company wishes to express our appreciation for the excellent acceptance of our products and pledges to maintain in the years ahead the high quality of design, workmanship and service that has become associated with OWEN Products.

The OWEN BUCKET Co.
BREAKWATER AVENUE, CLEVELAND 2, OHIO
BRANCHES: New York • Philadelphia • Chicago
Berkeley, Calif. • Fort Lauderdale, Fla.

An efficient batch plant and dependable Mack dumpers—two important factors in the modern paving methods used by L. G. DeFelice & Son of North Haven, Connecticut. Ten Mack dumpers supplied the dry mix for the two dual-drum pavers.

On the Connecticut Turnpike...

job time slashed by efficient

L. G. DeFelice & Son finished their section of the Connecticut Turnpike well ahead of schedule . . . thanks to efficient batch-haul paving. Their record for a 10-hour day was 1566 cubic yards—enough concrete for 4255 linear feet of 10-inch, 12-foot pavement. Their daily average over the five-mile, six-lane stretch was almost as high. The job was done with ten Mack dumpers supplying two dual-drum pavers working tandem, with wire fabric laid on the five-inch pour of the first paver.

Comments Joe DeLucia, project superintendent for DeFelice, "This job kept the Macks hustling. But they never let us down. We figure that our investment in paving equipment and crews is too big to gamble with trucks that can't keep going. On the vital hauling jobs, we rely on Macks."

The medium-sized Mack dumpers used for this important batch hauling were equipped with Mack

Each Mack dumper carried five 1½-yard batches. First batch dumped by opening tail gate. Air-operated batch boards, designed by Equipment Supervisor Felix DiGiusto, speeded dumping of the other four batches. Quickly removable batch boards convert trucks to conventional dumpers with a 10-yard capacity.

batch-haul paving

Quadruplex transmissions, four-wheel drive Mack Balanced Bogies with Power Divider, economical 150-horsepower Magnadyne gasoline engines, and power steering.

To find out how you can do more work at lower cost with fewer trucks, call in your Mack representative. Mack Trucks, Inc., Plainfield, New Jersey. In Canada: Mack Trucks of Canada, Ltd.

MACK

first name for

TRUCKS

There is no fussing with time consuming hoists and wire rope to spot this drill.

The big savings are in speed of set-ups and maneuverability. Set-up time is not production time.

Convenient controls, reverse and release rotation make for fast and easy steel changes.

the NEW Ingersoll-Rand CRAWL-IR MOST FULLY MECHANIZED CRAWLER DRILL EVER DEVELOPED

No other crawler drill is so fully powered — so fast and easy to setup — so safe and convenient to use. It will drill horizontally, vertically, or at any angle, with all boom and tower motions controlled hydraulically at the touch of a throttle.

The CRAWL-IR tows its own air power up slopes or over rough terrain. Heavy duty air motors propel the rugged knee-action crawlers. Call your I-R man or write for bulletin 4189.

The CRAWL-IR is not dependent on other equipment and men to move its air power—it tows its own.

Here is a graphic example of complete flexibility—toe holes out over the side of the crawler.

Sound design, convenience of controls and rugged construction give you all you could ask for in a crawler drill.

a Constant Standard of Quality

Ingersoll-Rand

11 Broadway, New York 4, N. Y.

CARSET JACKBIT

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FOR A PACE-SETTING DRILLING COMBINATION, POWER THE CRAWL-IR WITH A GYRO-FLO COMPRESSOR.

New Equipment . . .

Continued from page 53

large trees, by first splitting and weakening them with a sharp "stinger."

The Rome K G blade is available through Caterpillar dealers in sizes for Caterpillar D4 through D9 tractors. It is supplied either as a complete unit, including push frame, or as an attachment for Caterpillar "C" frames.

20-yd. Dump

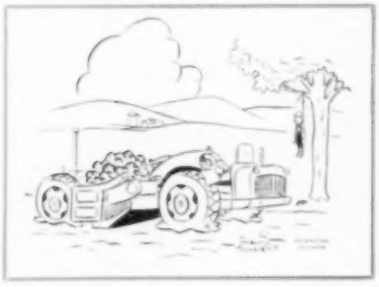
Manufacturer: Aveling-Barford, Ltd., Grantham, England.

Claims: The new Aveling-Barford type SN heavy dumper is Britain's largest end-dump truck. Its carrying capacity is 20 cubic yards (about 25 short tons) more than twice that of the largest dumper currently in production at the firm's Grantham works.

Aveling-Barford, which has produced more than 4,000 dumpers of 3 to 9-yd. capacity, has put three years of intensive market and technical research into development of the SN model. Pilot models are now undergoing thousands of hours of field test operation.

Every part has been specifically designed for the roughest off-highway haulage and for ease of operation and of maintenance. All assemblies are easily accessible; they can be removed with minimum disturbance to adjacent parts.

On the pilot models, power is supplied by a Rolls Royce 333-bhp, eight-cylinder, supercharged diesel motor. The twin plate clutch is air-operated; so are the wheel brakes. These brakes are supplemented by an automatic exhaust brake operated from the same pedal, reducing very considerably the wear on wheel brake linings. The transmission provides six forward speeds from 3 to almost 30 mph, with a single reverse speed. It is controlled through only one hand lever. With the introduction of a British-built Cummins engine, customers will have a choice between this and the Rolls Royce. An automatic transmission with torque converter will be offered as an alternative to the conventional transmission.



Wheel Tractors

Manufacturer: Caterpillar Tractor Co., Peoria, Ill.

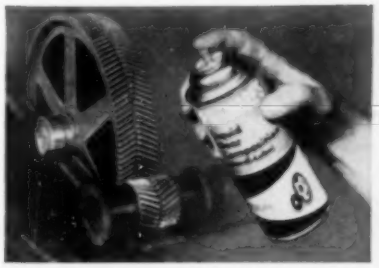
Claims: A new series of DW20 and DW21 wheel tractors, equipped with Super-Turbo engines which offer more power and greater operating efficiency, has been introduced.

The new wheel tractors are designated the Cat DW21 (series D) and DW20 (series F). Their Super-Turbo engines have been designed to provide a maximum output of 320 hp, accompanied by significantly improved torque rise characteristics. Operationally, these improvements combine to give the new

Continued on page 58

TRIAL SAMPLES

Of World-Famous WHITMORE'S Lubricants NOW IN AEROSOL SPRAY-ON CANS!



HANDI-LUBE LIQUID GEAR COMPOSITION

For open gears, sliding surfaces—exclusive formulas eliminate metal to metal contact, keep wear on the lubricant not the metal—no breakdown even after prolonged use under water—available for every climatic condition—packaged in handy 16-oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

WIRE ROPE SPRAY LUBRICANT

Exclusive formulas for lubricating and protecting wire rope, chain, springs. Penetrates to the core of wire rope minimizing internal friction and increasing usable life up to 300%—special protective qualities absolutely eliminate corrosion—non-gumming qualities reduce "carry-back"—packaged in handy 16 oz. aerosol spray-on containers or in bulk containers—send for a free trial sample.

65 YEARS OF LEADERSHIP LUBRICATING THE FOLLOWING:

• Open Gears, Dipper Sticks, Cams • Enclosed Gear Cases • Wire Rope and Cable
• Hydraulic Units, Torque Converters • Roller, Ball, and Sleeve Bearings • Speed Reducers

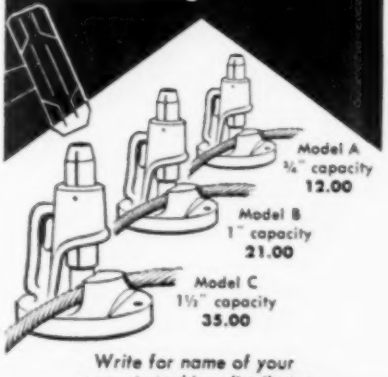
Est. 1893

THE WHITMORE MANUFACTURING CO.

LUBRICATING ENGINEERS

CLEVELAND 4, OHIO, U.S.A. PHONE: VULCAN 3-7272

WITH A HAMMERBLOW . . . 3 SHARP RAPS CUT WIRE ROPE CLEAN . . . *leave it round, ready for splicing or threading*



Write for name of your nearest stocking distributor

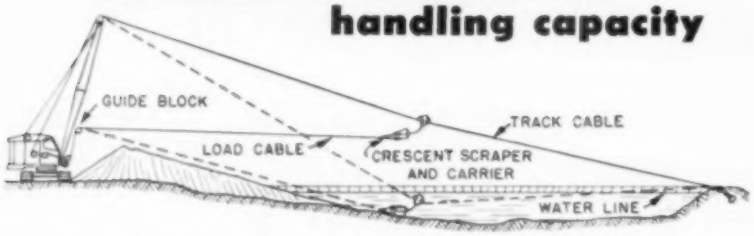
HAMMERBLOW

WIRE ROPE CUTTER CO.

26 Austin St. Newark 2, N. J. Bigelow 8-1045

the SAUERMAN METHOD...extends the reach of your crane

the CRESCENT SCRAPER...increases its handling capacity



Drawing shows crane using Crescent Scraper and carrier with a track cable. This arrangement increases effective digging range and permits gravity return to the excavation for a faster operating cycle. Maximum operating span is governed only by amount of cable that may be reeved on the drag drum.

Use This Fast, Economical Method For:

Cleaning Ponds
Trenching Streams
Sludge Removal
Cleaning Under Bridges
Building Reservoirs
Beach Construction

Any crane can handle a Crescent Scraper larger than its regular dragline bucket. Smaller units can increase their capacity about 50%. Large cranes can usually double their capacity. When the boom is supported by a strut or outrigger, a Crescent of still greater size can be used. Arrangements of this type have increased rated crane capacity as much as 4 to 1.

The Crescent hauls its load on the ground and the load is automatically deposited when the bucket is raised. Only the empty scraper bucket is lifted by the crane.

When a crane is equipped with a track cable, Crescent and carrier, it can reach farther, dig deeper under water or from soft areas without the nuisance of mats. Anchorage for the track cable may be fixed—or movable to provide easy shifting to a new line of operation. A tractor makes an excellent mobile anchorage.

Although the track cable method is best for increasing your machine's range, the Crescent can also be cast like your regular bucket.

Get the facts on how much the capacity of your crane can be increased. Give us the make, model and boom length. Ask for Field Report 228 and Catalog J. Catalog T tells how to use Crescents with tractors.

This Indiana contractor used the track cable method with a 1½-cu. yd. Crescent Scraper to trench across a river. After the water main was placed, the scraper backfilled the trench.

Boom support enabled this crane to use a larger Crescent. After a sub-grade of coral was placed, the 4-yd. scraper was reversed and used to grade the beach. Barge-mounted winch served as anchorage for track cable and supplied power to scraper on grading operations.

Important to Users of Blocks and Fittings: Get the new Sauerman bulletins showing the complete line of Wire Rope Fittings and Durolite Sheaves available from stock. Ask for Bulletins 164 and 165.

SAUERMAN BROS., INC. 622 SO. 28th AVE. BELLWOOD, ILL.

Crescent Scrapers • Slackline and Tautline Cableways • Durolite Blocks

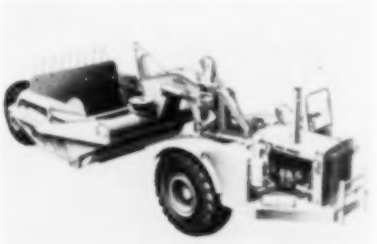
New Equipment . . .

Continued from page 57

machines the advantages of increased lugging ability and higher travel speeds.

The Super-Turbo engines introduce a new concept in diesel engine turbocharging. They incorporate an improved air induction system, intended to improve on the normally high fuel-combustion efficiency and power output of turbocharged engines.

Primarily, the air induction system of the engine provides accurate control of



turbocharger speed over its complete range and delivers more air to the engine. By contrast, standard turbochargers operate at reduced rpm when the engine is working at below-maximum engine speed. On the new engine, the control of turbocharger speed allows the engine to operate at maximum efficiency regardless of its changing load requirements.

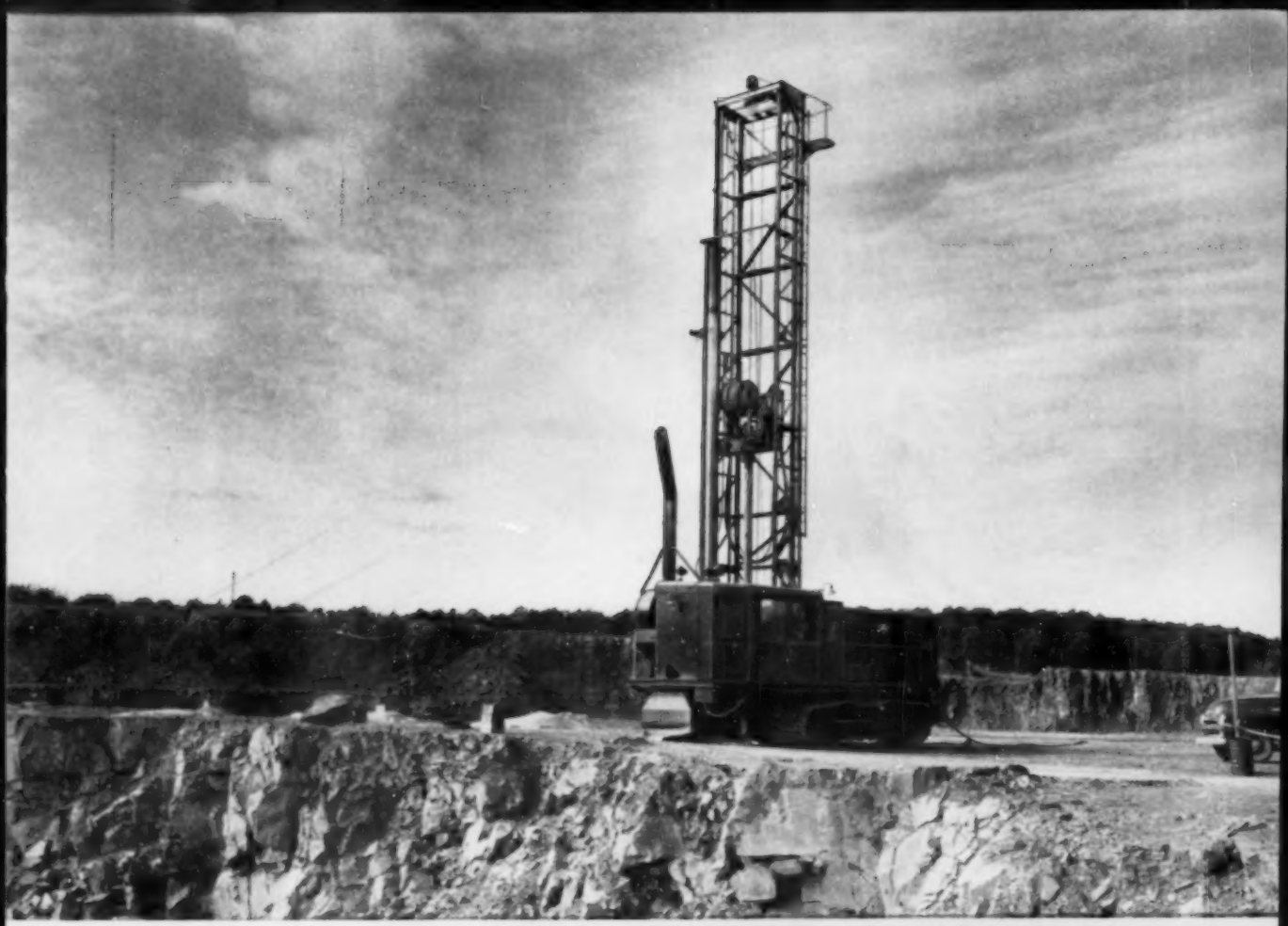
As an additional aid to peak engine efficiency, temperature of the air leaving the turbocharger and entering the cylinder is lowered as it goes through an after-cooler, increasing the air density. The denser air, when packed into the cylinder, provides additional oxygen for the combustion of more fuel, and the generation of more horsepower. Research tests have shown that the after-cooler results in 14% more air (by weight) being delivered to the engine.

Twin air cleaners and larger manifolds provide for increased breathing capacity.

Several operational benefits result from these engine features. Perhaps of greatest significance is the more than double torque rise afforded by the engine, which gives the wheel tractors greater lugging ability when operating under heavy loads.

Another operating characteristic of the Super-Turbo engines is their ability to provide equal rimpull for the new DW21 and DW20 at 10% higher travel speeds. Top speed of the DW21 is 22.6 mph, compared to 20.5 mph on the previous series DW21. Top fifth-

Continued on page 60



Wisconsin Quarry Adds 50-R to Speed Up Blast Hole Drilling

Just north of Wausau, Wis., Foley Brothers installed a 50-R drill at a rock quarry. Formations run to tough, hard-to-drill quartz and granite. Even in material like this, Bucyrus-Erie rotaries put down a lot of hole—fast.

Among the many advantages offered by the 50-R, two make it especially fitted for the material it is drilling at the Foley Brothers quarry. They are *variable drilling speed* and *variable down pressure*.

For controlled speed, the Ward Leonard variable voltage system gives the operator smooth, instant command over rotation of the drill pipe. He can choose the most efficient speed for a given formation. To meet requirements, he can vary the speed without stopping the drilling operation.

Hydraulic pulldown provides controlled load on drilling tools. For greatest possible penetration in hard rock, maximum down pressure can be exerted on the bit while the drill pipe is turning slowly.

The 50-R at Foley Brothers is a full-electric rig designed for drilling 9⅞ to 12¼-in. holes. For drilling 6¾ to 9-in. holes Bucyrus-Erie offers the 40-R with either full electric or diesel-electric power.

Get the full story on these drills today. Contact us direct for illustrated bulletins. Bucyrus-Erie Company, South Milwaukee, Wisconsin.

73858C

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

LEVERAGE ON BOTH SHELLS MAKES IT DIG DEEPER FASTER!

Double leverage makes the big difference! In KIESLER BUCKETS you get twice the leverage, 40% more digging power for real deep-down digging action. Power is applied to both shells through both lever arms at the same time for maximum efficiency.

Employing the mighty Ice Tong Principle, KIESLER buckets have proved themselves from coast-to-coast as the buckets that continuously out-dig and out-speed all others! Smooth, continuity of action is the theme from start to finish with KIESLER buckets. It starts with the full-scoop shell digging deeply into the material and grabbing up a full load. Then dumping starts the very instant the jaws begin to open. There's never a waiting period for the jaws to open fully before the dumping can take place. As a result there's a steady cycle of digging and dumping, digging and dumping; and the job speeds through on schedule without unnecessary handling. Pay loads are increased with KIESLER buckets, both in size and quantity; production soars.

It will bring you a rich return to find out how KIESLER can step-up YOUR profits if you're in the excavating or rehandling fields. Specify KIESLER . . . for the ultimate in buckets, backed by 65 years of manufacturing experience.

THE KIESLER MIGHTY Mighty O Ice Tong Principle ICE TONG PRINCIPLE

GUARANTEE

Kiesler Buckets are guaranteed to outperform and do a bigger day's work than any other Bucket of equal weight, width and size, when properly reeved and operated.

JOS. F. KIESLER CO. Since 1892

944 W. HURON ST. • CHICAGO 22, ILL. • MOnroe 6-7144

New Equipment . . .

Continued from page 58

gear speed on the new Cat DW20 is 35.8 mph, an increase of 3.7 mph over the previous model.

In addition to the new air induction system, many engine components have undergone design changes, in order to closely match the improved operating characteristics of the engines.

Included are new pistons; stronger piston pins, pushrods, rocker arms and camshaft; a newly-designed cylinder head and block; the introduction of new bearings; and the addition of a primary fuel filter.

Crawler Track Press

Manufacturer: Owatonna Tool Co., Department EE, Owatonna, Minn.

Claims: A track press that greatly reduces overhaul time for crawler tracks —with complete safety for operator and bystanders—has been announced by Owatonna Tool Co. Designated the Trackmaster model Y7000, the press pushes both pin and bushing simultaneously without broaching or damaging sidelinks. Tests show one man alone can take down and reassemble even badly rusted track in just half the time required using other presses—without damaging pins, bushings or sidelinks.

Based on research and development in cooperation with heavy equipment manufacturers, the new Trackmaster features a short 2-in. workstroke for faster and safer pressing. The Trackmaster can handle all makes and all sizes of track—even the largest—with grousers removed or left on (two bolts removed).

A powerful hydraulic winch with 5,800-lb. line pull draws the track along a conveyor to a hydraulic-powered indexer, which aligns the track link in the Trackmaster saddle. Then, in one stroke, hydraulic pressure to 125 tons eases even the most stubborn pins and bushings out of the sidelink. The Trackmaster also has a hydraulic power take-

off with a capacity of 9 gpm at 2,000 psi for operating other presses, cylinders and rams.

Trackmasters are available in both stationary and mobile trailer-mounted models. Standard power unit is a 7½ hp, 220-440-volt, 60 cycle, three-phase motor. However, any electric or gasoline motor with sufficient power can be used.

210-cfm Compressor

Manufacturer: Gardner-Denver Co., Department EE, Quincy, Ill.

Claims: Gardner-Denver has added a 210-cfm model to its line of rotary portable air compressors. The line now consists of five units—125, 210, 365, 600 and 900-cfm sizes.

The new RP-210 model has a clutch between the engine and the compressor, a design feature of all previous models.

With the clutch disengaged, the engine starts freely in cold weather, and warm engine water circulates through the compressor oil cooler and reservoir. Warm, free-flowing oil is supplied to the compressor as soon as it starts turning.

An oil pump assures positive oil flow for compressor lubrication and cooling, independent of receiver pressure, under all operating conditions.

The water-oil cooling system maintains constant operating temperature for both compressor and engine, even during extremely hot or cold weather.

The new unit, powered by either a gasoline or diesel engine, is available on two or four-wheel mountings, or on wood skids. The two-wheel unit is 12 feet long with drawbar, 67¼ inches wide, 6 feet 3 inches high and, with gasoline engine, weighs 5,240 pounds ready to run. The four-wheel model is 102 inches long, 65¼ inches wide and 6 feet 2 inches high.

Torque Converter Grader

Manufacturer: Le Tourneau-Westinghouse Co., Peoria, Ill.

Claims: A torque converter version of the Adams model 550 motor grader is the latest addition to the LeTourneau-Westinghouse line.

The machine, designated as the Power-Flow 550, becomes the firm's second grader with this type of transmission. The 660 size Power-Flow was introduced in the fall of 1956.

Providing a torque multiplication of 3 to 1, the 550 Power-Flow's transmission is a single-stage converter teamed with a four-range constant mesh gear box. The unit, manufactured entirely by LeTWesCo's Adams Div., employs the same design features as found in the Power-Flow used on the 660 size grader. This drive system provides the equivalent of an infinite number of gear ratios which adjust automatically to variations in load requirements. The advantages which result from this flexibility of power include increased efficiency, cushioning of shock load, reduction of mechanical wear and tear, as well as greatly simplified operation.

A feature contributing to the speed and ease of handling of the grader is a mechanism which allows the operator to make changes in travel direction from forward to reverse, and vice versa, without hand shifting. It is accomplished with a rocker-type pedal located where the clutch would be found in a standard transmission machine.

Another item to help the operator and let him give full attention to the machine's work functions is a tail shaft governor which automatically adjusts engine speed. Using it, the operator can set the speed, at which he chooses to work, with hand throttle or foot accelerator, and forget further manual throttle manipulation. The governor automatically measures requirement of varying resistance, load and grade and makes the necessary adjustment in engine speed to compensate and maintain a constant travel rate.

The extreme flexibility of power which the torque converter gives makes the unit ideally suited to tough grader jobs such as banksloping, ditching, heavy grading and other work where there are alternate light and heavy loads on the blade. In addition, the converter helps contribute substantially to the unit's job-to-job mobility by making it much more agile in traffic.

The torque converter and constant mesh transmission combination provides four forward speed ranges from a creeping .22 mph to 26.4 mph. The instant reverse provides an equal number of ranges from .21 mph up to 23.5 mph.

Engine options for the new grader are either the Cummins NHC-4-BI or the GM 4-71 both rated at 135 hp. With Cummins engine, the machine weighs 24,575 pounds; with GM engine, the weight is 24,100 pounds.

GUARANTEED
unconditionally against breakage!
CROSBY-LAUGHLIN
Load-Rated
Trademark
HOOKS

Greater safe working loads—the highest guaranteed capacity *per size*—are offered by Crosby-Laughlin* "Load-Rated" Hooks. Proved design and new alloys—drop forged and heat treated—increase capacities by 50% with no increase in weight! This complete line gives you capacities from ¾ to 150 tons—is unconditionally guaranteed against breakage. Every "Load-Rated" hook with drilled cam converts quickly to a safety hook. Demand the "RED fittings," symbol of quality and the world's most complete line of drop forged fittings. *New catalog* has detailed specifications on over 2000 items. Available from construction, industrial and mill supply distributors. Or write:
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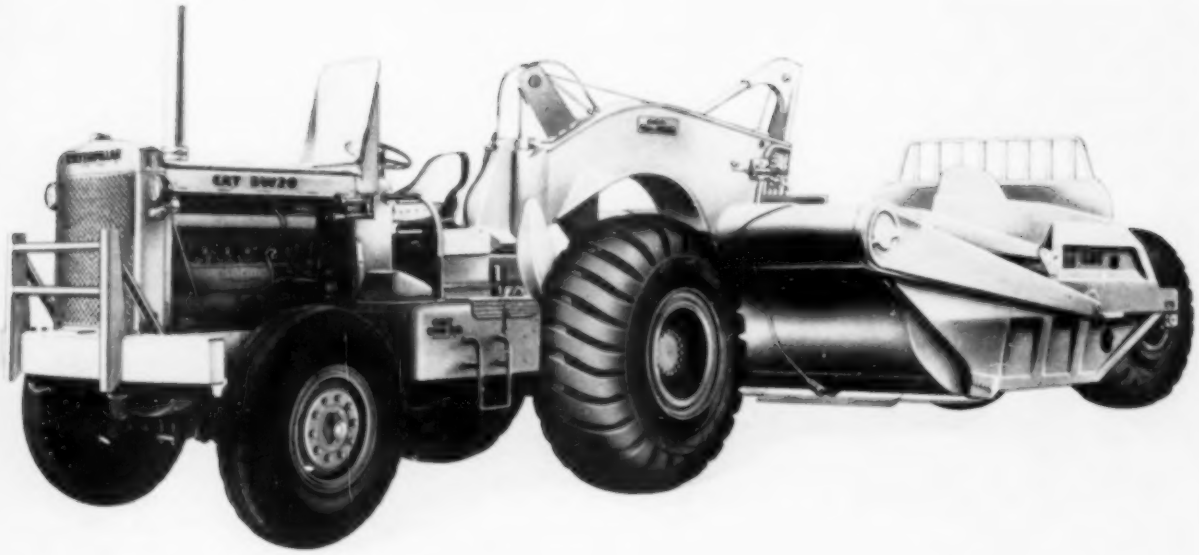
HERE THEY ARE!

DW20 and DW21 WITH



DW20
(SERIES F)

New HP—320 (maximum output)!
New Torque—28% torque rise!
New Speeds—up to 35.8 MPH!

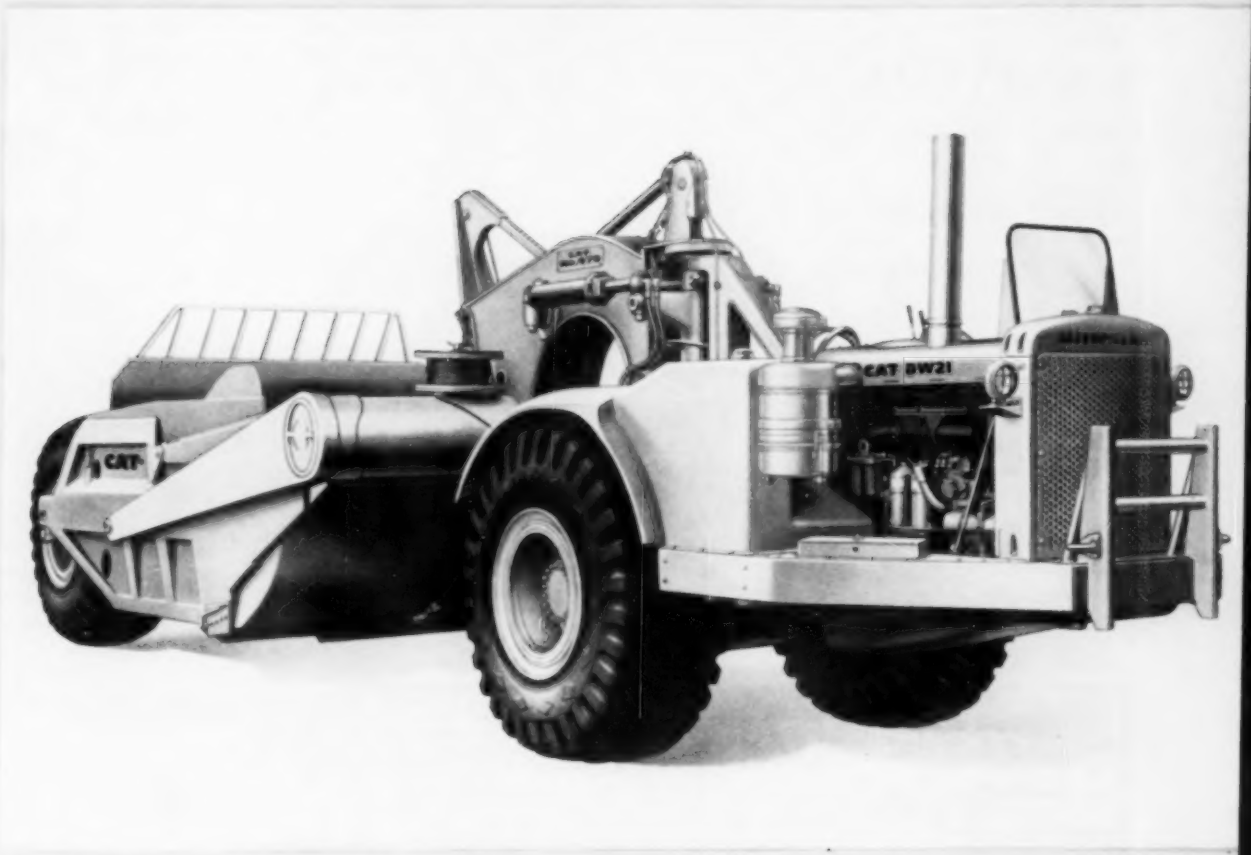
Powered with a brand-new SUPER-TURBO Engine, these big Caterpillar rigs are faster, more powerful than ever. Horsepower of both the DW20 and DW21 is increased to 320. At equal rimpulls, speeds are 10% greater, and torque rise is more than double compared to the previous models. Now you can move earth faster and easier—and still have the dependability for which Cat equipment is famous.

Behind the new performance of the new DW20 (Series F) and DW21 (Series D) is their new SUPER-TURBO Engine. This amazing power plant incorporates a new concept in diesel engine turbocharging. Its heart is a revolutionary air induction system, unique in earthmoving machines . . . and another Caterpillar first.

This system allows use of more of the Turbocharger's potential than was possible before. Results: twice as much torque rise, higher horsepower, better acceleration and gradeability.

But more important, these results translate into faster cycles, greater production and more profit—*for you.*

NEW INCREASED HORSEPOWER



DW21
(SERIES D)

New HP—320 (maximum output)!
New Torque—28% torque rise!
New Speeds—up to 22.6 MPH!

Add to these DW20 and DW21 power advantages all the design features of Caterpillar LOWBOWL Scrapers. These matched units are built to use the greatest possible loading potential of the new power in the tractors.

Higher horsepower! New torque rise! Faster working speeds! Your production will hit new highs and your costs will drop when you turn these improved rigs loose on your job.

Call your Caterpillar Dealer right now and set up a demonstration on a job of your choice. The sooner you see the powerful new DW20 and DW21 in action, the sooner you'll start getting bigger returns from *your* wheel spread.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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SUPER-TURBO ENGINE
—First in the Industry
—First in Performance

NOT in the Contract

"What are you putting in your vest pocket, Dudley?"

"That's a stick of dynamite. Every time Riley sees me he slaps me on the chest and breaks all my cigars. The next time he does it, he's going to blow his hand off."

Mrs. Trent, seated in her living-room, heard the back door slam. Thinking it was her young son, she called: "I'm in here, darling. I've been waiting for you."

There was no answer for a moment, then a strange voice faltered: "I'm sorry, but I ain't your regular milkman."

"I just can't understand those Russians," says the beautiful blonde. "They drink vodka day and night and all they say is 'Nyet.' When I drink vodka all I can say is 'Yes.'"

A workman was perched on top of a ladder cleaning the clock in the city building and a Nosey Joe called up to him: "Something wrong with the clock?"

"No, I'm near-sighted."

Which reminds us of the meek little clerk who approached his employer for a raise after only six weeks on the job.

"Don't you think it's a little soon to ask me for a raise?" snapped the boss. "First you've got to work yourself up."

"Are you kidding?" groaned the little man. "Look at me—I'm shaking all over!"

Doctor: "I've examined you thoroughly, but I can't seem to find the cause of your trouble. However, it's probably due to drinking."

Patient: "Oh, that's okay, Doc. I'll come back sometime when you're sober."

A little girl was left in sole charge of a bakery while the owner crossed the street for a package of cigarettes.

While he was gone a woman entered and seeing the little girl asked: "Aren't you tempted to eat an eclair when no one is looking?"

Little girl: "Oh, no, that would be stealing (perking up brightly). I just lick 'em."

"If that's all your equipment, I can loan you lunch money for three days."

She: "You used to hold my hand," (and so he took her hand).

She: "You used to kiss me," (and so he gave her a slight smack and said, "Now be quiet, I want to go to sleep").

She: "You used to bite my neck."

He got up and she said, "Where are you going?"

He: "To get my teeth."

Jones was sitting down to breakfast one morning when he was astounded to see an announcement of his death in the newspaper.

He rushed to the phone at once to call up his boss.

"Hello!" he shouted. "Did you see the announcement of my death in the newspaper?"

"Yes," said the boss, "where are you calling from?"

Father: "Get up, Joe. When Abraham Lincoln was your age, do you know what he was doing?"

Joe: "No, I don't, but I know what he was doing when he was your age."

Rastus was dead. A wonderful funeral was in progress. The preacher talked at length of the good traits of the deceased, what an honest man he was, what a loving husband and kind father.

Finally, the widow whispered to one of her children, "Go up dere and take a look in de coffin and see if dat's yore paw."

Elderly lady: "Isn't it wonderful how these service station people know where to set up their pumps to get gas!"

A tractor salesman approached a prosperous looking farm where he observed the farmer slowly and painfully guiding a plow drawn by a bull. Thinking that this offered an excellent opportunity for a sale, he pointed out to the farmer the many advantages of a tractor.

To his surprise, the farmer said that he already had a tractor and that it worked fine and was in the barn. When asked why the bull was being used for plowing, the farmer replied: "Son, I aim to teach this critter that there's something else in life besides romance."

"I wouldn't worry too much if your son makes mud pies," the psychiatrist consoled the woman.

"And the fact that he sometimes tries to eat them is also quite normal."

"Well, I don't think so," rasped the woman, "and his wife doesn't either."

FREE WIRE ROPE RECOMMENDATIONS TO HELP YOU SAVE MONEY

Prepared by Experts, Booklets Give Specialized Wire Rope Uses in 5 Fields

What do you do when you have to decide what rope to order? Do you rely on your memory or look up the last order?

Here's an easy way to get the right answers *fast*. Refer to the Wire Rope Recommendation Booklet prepared by HAZARD engineers as a result of years of work in the field with every kind of machine that calls for wire rope. There's a different booklet for each of five basic industries—general contracting, industrial, mining, logging and marine. We'd like you to have these booklets for quick reference because they'll save you time and money by giving you the right answer of the right rope to use for any job in your field.

Written in clear, non-technical language, these new booklets are from 8 to 24 pages long. In addition to detailed wire rope recommendations for your own field, there is a page of LAY-SET wire rope characteristics which explains fully the basic terms of diameter, construction, lay, grade and core . . . all necessary in understanding wire rope nomenclature. Many action pictures of equipment at work also help to show the reader how recommended wire ropes are actually used on the job.

Send today for copies of any or all of the 5 free Wire Rope Recommendation Booklets. Simply check the booklets you would like to receive, in the coupon provided.

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American Chain & Cable Company, Inc.
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HAZARD WIRE ROPE DIVISION, Wilkes-Barre, Pennsylvania

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Complete information and specifications await your letter.
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Dams . . .

Continued from page 27

aspects of rock placement was a crane-placed blanket on the upstream face of both dams. The handling and placement of large size rock in an area of this kind demand experience and skill because it is one of the most dangerous of construction operations. Traditional placement methods consisted of handling rock with cable slings, which at times caused sling slippage and often resulted in serious injury to personnel.

To eliminate danger and speed placement, two pin systems were devised for handling heavy chunks of rock. At Courtright, a small jackhammer and compressor are used to sink a 2-ft. deep hole two inches in diameter into each rock. A single tapered Sullivan pin, attached to the load line of a crane, is then dropped into the hole and secured against a slim, tapered steel wedge placed alongside the pin. When the load line is hoisted, the pressure of pin and wedge against the side-wall of the hole is sufficient to lift the rock. If the rock is exceptionally big, two pins are used.

At Wishon Dam a slightly different method was used. Three shallower holes were drilled into the rock at different angles. The load line of the cranes carried three straight pins. Dropped into the triple holes, the pin exerted opposite directional force to pick up the stone.

Crane handling equipment for placed rock included two Bucyrus-Erie 54-B's at Courtright Dam and five Northwest 95's and one 80-D at Wishon. These cranes were used with 60-ft. booms and had seven-man crews. By placing extra lagging on the hoist drums, increased hoist speed was developed. It was possible, after considerable refinement, to produce 15 cubic yards an hour for each seven-man crew.

When rock work was completed, crews would almost immediately step in to install concrete facing slabs. Central carpenter yards at each dam produced the end forms, which were installed by crane. Concrete aggregates in four sizes—2½, 1½, ¾ and ⅜-in. minus—were produced at the river bottom near Wishon Dam. The Conveyco crushing plant's principal units consisted of a Cedarapids 2236 jaw primary, a 4½-ft. Symons cone crusher and auxiliary vibrating screens.

The concrete was batched from a Conveyco plant, then hauled dry to 34-E Koehring mixers at each dam. In addition to Type II alkali-resistant Permanente cement, additives included Pozzulan (supplied by Airox), which substituted for 15% by weight of cement; Pozzolith 3, added at a ratio of ¼-lb. per sack; and Dresinate XX air entraining agent.

One of the most ingenious concrete placing tricks at Wishon was the use of a 60-ft. slip form, an improvement on the same machine used at Courtright. These slip forms were built by Clark Welding Works, Sacramento, Calif., and used a full-length 4-ft. screed. Pulled by cables and two Tulsa winches, each slip form was capable of handling about 50 cubic yards per hour. Viber electric vibrators consolidated the concrete tight against bearing beams, large crane-placed rock underneath and a double mat of heavy reinforcing steel.

At the end of the 1957 work season, December 1, Courtright Dam was about 67% completed and Wishon Dam about 85%. All rock work was finished at Wishon during 1957, and concrete work was well underway. The two dams are to be finished near the end of 1958.

Equipment maintenance for both dams was doubly important because of the short work season. Therefore, a comprehensive check list was made for each piece of equipment. Based on a study of manufacturer's literature and

Crewmen use new Lewis pin system of handling rock, devised to eliminate dangers of old sling method and speed work.

service catalogs, it included point-to-point lubrication, service and adjustments to engines, gear components, torque converters and electrical systems. In addition, each hauling unit received a thorough check after each 100 hours of work and got detailed inspections at 500, 1,000 and 1,500 hours.

Each driver was furnished with a memo tablet. He was encouraged to report anything, however minor, which interfered with the topnotch performance and safety of a unit. A complete check list and service history went with each machine if it was transferred between jobs or off the job.

At the end of each season every unit was given a thorough inspection and overhaul. A $160,000 spare parts inventory with a Cardex indexing system was kept on the job. The equipment repair shop had a heavy reinforced bed with embedded anchors for straightening truck frames and beds, if they were twisted by large rock. There was also a 10-ton electric overhead crane for making heavy lifts.

Engineering operations for the two dams are under the general supervision of Walter Dreyer, vice president and chief engineer for PG&E. H. W. Haberkorn is manager of hydroelectric construction and George Thacher is project engineer for the Kings River project. Field supervision at Wishon and Courtright dams is under P. J. Helbert.

For Morrison-Walsh-Perini, B. L. Perkins is project manager and Chet Dapron is equipment superintendent at both Wishon and Courtright dams. At Wishon Dam, H. D. Gard is general superintendent. William McMurran holds the same relative position at Courtright Dam.

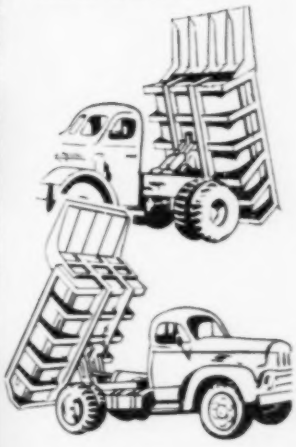
Powerhouse . . .

Continued from page 31

tor, three motormen, a swamper and a dump crewman. On the day shift there is also a six-man bull gang, including its foreman, that does miscellaneous cleanup work.

Underground work is under the general supervision of PG&E's Project Engineer George B. Thacher, assisted by C. B. Joslin. For Kings River Constructors, Carl Larson was in charge of the Haas powerhouse excavation with Tom March as underground superintendent. Tunnel work is under Project Manager P. M. Lee, a long-time tunnel man who has built some of the toughest ones in the nation.

TODAY'S BIGGEST VALUES IN ORE AND ROCK MOVERS



Marion rock bodies can be mounted with twin jack telescopic hoists (photo at left and top illustration) and with double arm underbody hoists (bottom illustration).

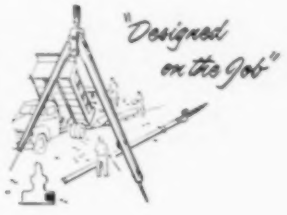
Marion ROCK BODIES and HOISTS . . . they're made to stand abuse

Designed for the severest type of service, Marions are built to take it under a shovel on all types of rugged off-highway operations.

Heavy steel armor plate combined with thick oak planking and on-the-job designing is assurance of "day-in day-out," long-life use from all Marion rock bodies. Together with heavy-duty Marion hoists, these rugged bodies will move big payloads fast with minimum downtime and maintenance costs. The result is substantial savings over a period of many years, making Marion rock bodies and hoists today's biggest values for handling rock and ore.

MARION
BODIES AND HOISTS

MARION METAL PRODUCTS CO.
MARION, OHIO, U.S.A.



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Gasoline powered

CUT YOUR DRILLING TIME!

Amazing drilling performance with revolutionary Demo Portable Rotary Hammers... a truly portable, light-weight hammer that drills by rotation and shock wave....

Suitable for horizontal or overhead drilling through materials such as reinforced concrete or masonry—using ½" to 8" detachable carbide core bits.

AIR, GASOLINE, OR ELECTRIC POWERED
(with built-in high speed water and air swivels)

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A SUBSIDIARY OF DARCO INDUSTRIES, INC.
2151 E. ROSECRANS AVENUE
EL SEGUNDO, CALIFORNIA

Lubrication . . .

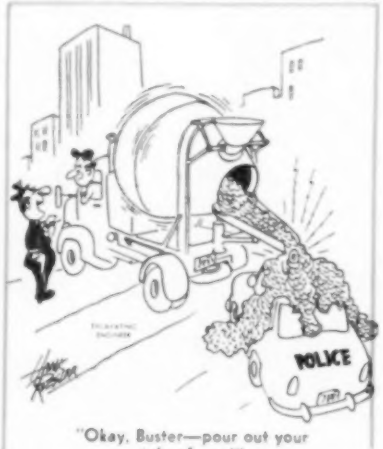
Continued from page 31

maximum efficiency. It goes without saying, however, that the viscosity must be sufficiently high to lubricate any bearings or other moving parts.

Particularly in closed systems, where the oil is re-used for a long period of time, the severe heat conditions tend to oxidize the fluid and form sludge and varnish deposits unless the oil is well fortified with an oxidation inhibitor. Resistance to foaming is necessary as foaming in the system can cause erratic operation. Likewise, the fluid must be capable of preventing rust formation. Even small amounts of rust in a converter can do a large amount of damage to precision made parts. Additionally, the fluid must not affect any seals used in the converter, and it must have a low pour point.

SAE 10W motor oils of the MIL-L-2104A type have all the desirable properties necessary to make them suitable for torque converter fluids. Many of these oils also have been qualified to meet the requirements for "hydraulic transmission fluid, type C" as required for use in one popular converter used on several different makes and models of earthmoving equipment.

Gear oils—Straight mineral gear oils can be used successfully in transmissions, differentials and other gear cases containing spur gears or spiral bevel gears where rolling contact only occurs between the teeth. When other gear types are used where there is sliding action as well as rolling action, such as that found in hypoid gear sets, an extreme pressure or multi-purpose type gear oil is required. Gear oils cushion the heavy loads usually existing in gear trains, including the shock loads often encountered. Without the extreme pressure properties imparted by multi-purpose gear oils, however, welding of the gear teeth can occur. These gear oils are also resistant to oxidation, foaming and to corrosion.



"Okay, Buster—pour out your tale of woe!"

Extreme pressures are not normally present in spur or spiral bevel gear trains. They can exist, however, if slight misalignment of the gears occurs. Because of the added protection afforded as well as from the standpoint of product simplification, it is desirable to recommend a multi-purpose gear oil of the MIL-L-2105 type for all gear case applications.

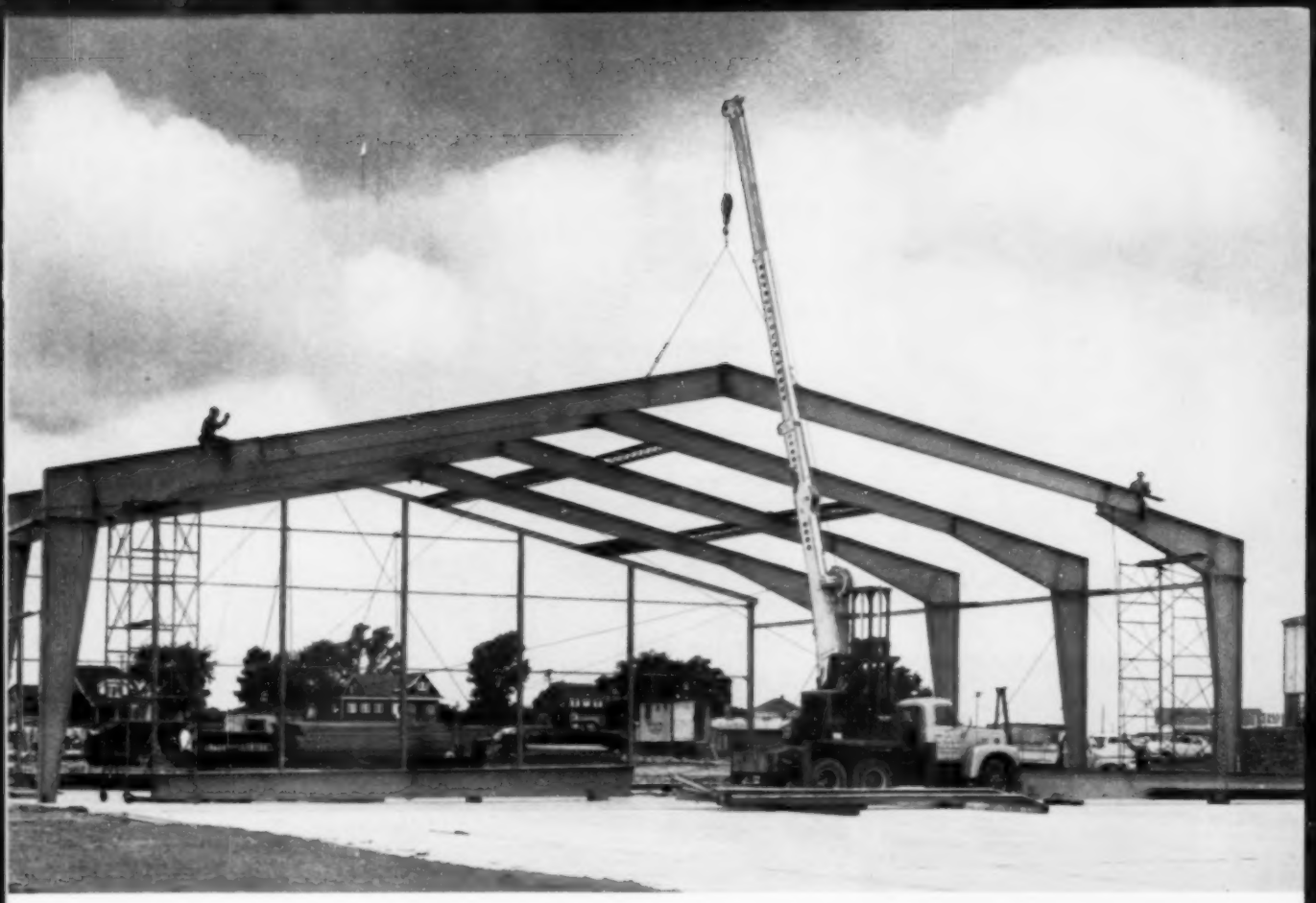
Grease—A good, high quality multi-purpose grease is a must for simplified lubrication plans. Such a grease should be water resistant for use in track rollers, water pumps, and as a chassis lubricant. It should have a melting point in the 350° to 400° F range for use in the drum clutch bearings of shovels and cranes and tractor clutch throw-out bearings, where a low temperature grease could run out and ruin clutch faces. It must be oxidation stable and also have good mechanical stability. It must have load carrying ability high enough to make it suitable for heavy-duty wheel bearings. It must have good dispensability even at low temperatures, resist impact and squeeze out, prevent rust, resist throw off, separation and bleeding.

Misunderstood Term

The term "multi-purpose" is often misconstrued to mean "all-purpose" by field people. While there are many multi-purpose greases that meet the requirements stated above, they are not "all-purpose" products, and there will be occasions when special greases will be required for a few specific applications. Some makes of track rollers fall into this category, as we have mentioned previously.

Open gear lubricants—Open gear lubricants must cling to the teeth of gears, even under conditions of high pressure, temperature and speed. They must cushion heavy loads, minimize wear, be resistant to water and be easy to apply. In the past, such lubricants were semi-solid in nature, requiring heat for application, and were very difficult to apply. The result was that too often lubrication intervals were over-extended. Today, however, special exposed gear lubricants, which can be handled like any other grease, are available to the

Continued on page 70



Outriggers down, boom extended, this Hydrocrane lifts a heavy girder for an airplane hangar in Milwaukee, Wisconsin.

To give you a money-makin' edge . . .

HYDROCRANE'S BUSY BOOM PICKS UP EXTRA JOBS—EXTRA PROFITS

Boom swings left and right . . . telescopes in and out . . . moves up and down — at the flick of a lever. That's how Bucyrus-Erie's *all-hydraulic* Hydrocranes can get in more lifts per day, build extra profits. With this boom, you can change boom angle *and swing or telescope at the same time* — a real money-makin' edge on competition.

And, there's plenty of reach. Boom telescopes 8 feet on the 5-ton H-3, 12 feet on the 12-ton H-5. For longer reaches, 10 and 18-ft. jibs are available for the H-3 — 10 and 20-ft. jibs for the H-5.

Then, for fast between-job travel, the boom retracts neatly into a compact unit that nests over the cab . . . makes machine legally transportable in terms of overall length, (less than 35 feet overall).

Your Bucyrus-Erie distributor is ready to show you the busy boom that gives you a money-makin' edge on competition. 239H58C

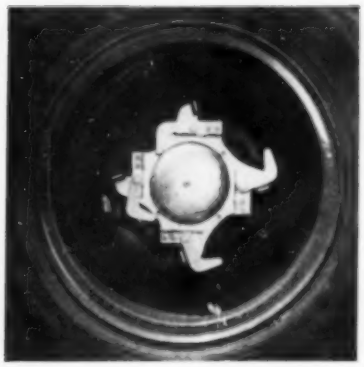
Other Hydrocrane money-makin' edges

- low-cost new or used standard commercial motor truck mount
- short tail swing for close-quarter jobs
- quick setups and knock-downs, open road speeds up to 50 mph
- high lift capacity per pound of truck, per foot of tail swing

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

It warns men he can't!



BULLARD MECHANICAL

Back-Up Alarm

Almost every day on some crowded job site, with trucks maneuvering forwards and backwards, a driver grinds into reverse ... rear vision is blocked ... then ... tragedy!

This simple, failproof, mechanical back-up alarm never forgets to warn men behind. A loud klaxon-like bell rings the minute wheels turn in reverse. It is a complete self-contained unit that can be easily installed on almost all vehicles with conventional wheels.

Write for technical literature, installation instructions and test reports

BULLARD
INDUSTRIAL SAFETY EQUIPMENT

E. D. BULLARD COMPANY, Sausalito, California

Lubrication . . .

Continued from page 68

contractor. These new lubricants contain additives to make them extremely adhesive, and are able to carry the loads required. Since they are easy to apply, proper lubrication intervals are more likely to be observed.

Simplified Recommendation

By study of his lubrication requirements, and consolidation through the use of multi-purpose products, a contractor can satisfactorily take care of approximately 95% of his lubrication requirements during warm weather with five basic products:

1. SAE 30 engine oil of the MIL-L-2104A level or higher for engines, air cleaners and reciprocating type air compressors.
2. SAE 10W engine oil of the MIL-L-2104A level for hydraulic systems and torque converters.
3. Multi-purpose MIL-L-2105 type gear lubricant for all gear cases.
4. Suitable multi-purpose grease for all grease applications.
5. Exposed gear lubricant for swing gears, dipper sticks and other open gears.

By combining all of the various lubricant requirements into a minimum number of products, the volume of each becomes large enough to justify purchase of all of them in full drums, for economy. At the same time, the lubricants are kept clean and uncontaminated because of the manner of dispensing, the chances of mis-application are minimized and the time required for lubrication is reduced.

The finest of lubricants and simplified lubrication plans are worthless unless the application of the lubricants is correct. Although the quality of many of the new multi-purpose lubricants is such that some mis-applications can be tolerated for short periods of time, such practices will ultimately lead to trouble. Modern equipment is so diversified and complex that a handy, condensed lubrication guide is a must to "get the right product in the right place at the right time."

If we might make a personal aside here, it has been the experience of the authors that the lube man on most contractors' spreads is the "low man on the totem pole." Too often the man with the least experience and fewest qualifications is assigned to the job. It is our hope that the importance of proper lubrication will be more widely recognized and that the status of the lube man will be raised by placing him on a level comparable to equipment operators or others in the organization. Such a move would take him out of the "unskilled labor" category and attract and keep good men on the job.

S. J. Groves & Sons, Inc., Minneapolis, Minn., used this lube truck on an Ohio project. It has a Grayco multi-reel lubricator with pneumatic dispensers; an 85-cfm Ingersoll-Rand air compressor; a small Onan light plant for flood lights; and space for drums.

earning power

Look at the rugged construction of the Aveling-Barford 4½ cubic yard Shuttle Dumper: examine its design features: then consider the economy of its powerful diesel engine, its low maintenance costs: its two-way steering, fast running and fast tipping, and you will realise how, even on the toughest jobs, it will increase your earning power by carrrying more loads at less cost.

- Two-way steering and four speeds forward and reverse.
- Instantaneous tipping—gravity and power assisted.
- Unit construction of power unit and transmission.
- Totally enclosed all-weather cab (optional extra).

Write today for Catalogue No. 1703/10 for full particulars.

AVELING - BARFORD

4½ cu. yd. Dumpers

AVELING-BARFORD LIMITED • GRANTHAM • ENGLAND

Speed Sand and Gravel Removal With Bucyrus-Erie Dependability

Bucyrus-Erie dependability is helping to lower costs in sand and gravel plants all over the country. A few of these operations are shown here. The machines on these jobs are built tough. Parts are large, strong, few in number — there is little that can go wrong. Machinery is arranged simply, compactly to provide strength, durability and stamina. Look over the sand and gravel jobs pictured here. Then ask your Bucyrus-Erie distributor about the many economy features of the Bucyrus-Erie ⅜ to 4-cu. yd. line of excavators. Do it today. 463E50C

This 88-B strips overburden at a gravel pit south of Dallas, Tex. "Our 88-B is doing a very good job," says the project superintendent. "It's just what we needed for this location." The owners of the 88-B, who operate three gravel plants in the Dallas area, benefit from its fast, easy handling and from the lack of mechanical trouble.

BUCYRUS ERIE

A Familiar Sign at Scenes of Progress

BUCYRUS-ERIE COMPANY • SOUTH MILWAUKEE, WISCONSIN

A 71-B loads sand and gravel for highway construction in New York state. The job, consisting of close to a million yards of material, is located on Long Island. Here, as on scores of construction projects from coast to coast, Bucyrus-Erie dependability pays off.

A sizable base course crew and an entire rock plant operation depend on this 38-B shovel to dig continuously without breakdowns. It is not disappointing its owners, who praise it for its dependability. The 38-B is working in Texas.

"We own four 15-B draglines and consider them the very best buy on the market," says the satisfied owner of the 15-B shown here. This machine loads pit gravel for rural road maintenance in Alabama. In this wet pit operation, the dragline excavates a staked-out 6-acre area to a depth of 9 feet.

A Bucyrus-Erie 54-B dragline teams up with a 51-B (in background) to excavate river floor overburden and pit run gravel. The material from this pit supplies a commercial gravel plant northeast of Ft. Worth, Tex. The steady operation of these machines is important because the company's six plants depend on them for a continuous supply of sand and gravel.

TO ADVERTISE: All advertising in this section is payable in advance. Rate: $1.00 per line, or $12.00 per inch of 12 lines. Minimum charge $4.00. No discounts; no commissions. Please count your copy carefully to avoid delay. Each line contains 41 characters (34 characters if all capital letters are used). Count spaces and punctuation as one character each. Allow 10 characters for box number, if blind advertisement is desired. Be sure to enclose the correct amount of money with your order. Closing date—10th of preceding month. Example: January closes December 10th.

TO INQUIRE: Be sure to address your inquiry to the advertiser by using the correct box number. Mail your letter in care of Excavating Engineer, South Milwaukee, Wisconsin. Write each advertiser a separate letter. Do not write us for name and address of advertiser. This information will not be given out. We have no information about the equipment advertised other than that shown in the advertisements themselves.

LARGE SHOVELS, CRANES, DRAGLINES — 3 YDS. & UP

2-W Monighan Walking-Type Dragline #492, 85' boom, 2-year old D-13000 Caterpillar diesel engine #4S685, 2-yard Hendrix bucket, 2½ yard Page bucket, some spare parts, fair operating condition. Box 3708

Bucyrus-Erie 120-B dragline, 100' boom with gantry mast, 4' tracks, A-1 condition, located northern California. For sale or lease.

THURMAN & WRIGHT
625 Market Street San Francisco, Calif.

Used Bucyrus-Erie, class 175-B electric dragline excavator tractor mounted with mats, 125' boom, 3-yd. medium weight bucket, power supply—three-phase 60-cycle, 2300-volt, including 1000' power cable, southern location, price reasonable. For further details consult P. O. Box 3726.

SMALL SHOVELS, CRANES, DRAGLINES—UP TO 2½ YDS.

EXCAVATORS AVAILABLE FOR RENT OR PURCHASE

1—Bucyrus-Erie 15-B dragline with 30' boom and fairlead. With Waukesha gasoline power unit. Tracks and machine in good general condition. Ser. #29742.

1—Bucyrus-Erie 15-B comb. 40-10 dragshovel solid type with 36" blade type side cutters. Powered with a Caterpillar D-315 diesel engine and the machine is equipped with the following: Unit 51-A electric starting; Unit 74 Caterpillar mounting, long frame and 24" wide tread. Serial #109496—new in 1953. REPAIRED, CLEANED AND PAINTED IN EXCELLENT CONDITION.

1—Bucyrus-Erie 1952 H-3 Hydrocrane mounted on a Ford F-6 truck with heater. Truck and tires in good condition. This machine is equipped with: Unit #1 operator's cab; Unit #102 differential lock; Unit #104-C 2-speed rear axle; recirculating heater; ¾ cu. yd. bucket, tagline, reel, complete crane equipment; telescopic boom from 18' to 26'; unit H-E-Q hoe equipment with 18" wide dipper; 2½ dia. hoist ram #9404-D Sprag UNIT OVERHAULED, CLEANED, PAINTED AND IS IN EXCELLENT CONDITION.

1—Northwest model 25—¾-yd. shovel with Kohler model #E light plant. Powered by Buda 468 diesel power unit. Ser. #10705. Machine new in 1948. Everything except the engine was overhauled by the former owner about a year before it was traded. Can be put right to work.

Write or Call: Jim Perkins
WM. H. ZIEGLER CO., INC.
2929 University Ave., S.E.
Minneapolis 14, Minn.
FRanklin 1-7971

One Bucyrus-Erie Model 41-B, 3 motor AC electric shovel, serial no. 10796, 1½-yd. dipper, cat-mounted, 26" treads; 22'6" boom, 15' handle; good operating condition. Many replacement parts for swing and crowd machinery recently installed or available. Located Mid-West.

One Bucyrus-Erie Model 52-B, Ward-Leonard electric shovel, serial no. 11395, equipped for 3 phase, 60 cycle, 440 volt operation; 2¼ cubic yard dipper, 30' boom, 18' handle; equipped with power boom hoist and electric light plant. Well maintained and in good operating condition. Caterpillar units recently overhauled. Located Mid-West. Box 3710

LeTourneau 12-15 yard, Model Y-12, 4-wheel scraper, good condition, good tires. American Blue Stone Co., Portageville, N. Y.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Two 15 yard LaPlante-Choate scrapers, not sprung, good tires and one 10 to 12½ yard Slusser-McLean scraper.

38-B Bucyrus-Erie crane only, 1948, Caterpillar motor, like new 65 or 70' boom, catwalk counterweight, fairlead and tagline. Shovel front available.

Koehring back hoe, 1942, gas motor in good shape $4500

1954 Model 25 Northwest backhoe, like new.

Lima ¾ Paymaster backhoe, crane and shovel, 1954, Caterpillar motor Northwest 2½ yard shovel front only.

1957 model 6 Northwest 1¼ backhoe with 65' of crane boom and 1½ yard shovel or nut.

1949 International TD9 Bucyrus-Erie 1 yard shoveldozer, new tracks.

Hughes-Keenan crane for rear mounting on D7 which is equipped with hoister winch.

Three sets of sticks for model 6.

2 buckets, 1½ and 2 yards for model 6.

2½ yard shovel front for 80D.

Peerless 4" deep well pump with 4 cylinder Wisconsin motor, and 2"x1¼" Allis-Chalmers pump with 1 cylinder Wisconsin motor—both pumps are new.

2½ yard lip for Marion—2 yard lip and door for Northwest—1 yard lip for Link Belt—2 yard front section lip for Lima or Lorain—door for bucket on 10-B Erie.

Two 2 drum, 2 naggerhead cargo winches from ships, one new, one used, electric motors.

R. E. CUNNIFF CONSTRUCTION MACHINERY
393 Brookline St. Newton, Mass.

Bucyrus-Erie Model 54-B shovel and crane combination, Serial 77778, powered by Buda Model 6DC-1879 diesel engine, serial 36869-F, equipped with electric starting, Kohler light plant, 30" flat pads, standard mounting. This machine has 26' boom, 18' handle with 2½ cu. yd. shovel front, 100' crane boom with 20' jib, high gantry and fairleads. This machine is in excellent condition and ready to work. Price $52,500

R. L. HARRISON CO.
1801 4th St., N.W. Albuquerque, N. M.
P. O. Box 1329 Phone: 7-8811

Four 141 Bucyrus-Erie model 54-B Ward Leonard electric shovels each with 28' boom, 18' handle and 2½ yard dipper, for 3 phase, 60 cycle, 2300 volt service, including 5KVA 3300/440 volt auxiliary transformers and 2KVA-32 volt lighting system. Two machines new in April 1941, one March 1942 and one December 1946. Location Minnesota iron range.

PICKANDS MATHER & CO.
700 Sellwood Bldg. Purchasing Dept.
Duluth, Minnesota

1 only International model TD-24 diesel crawler tractor, serial #TDE 1017, with 7 roller track frame, torque converter, equipped with cable controlled angledozer and model J, rear mounted towing winch with cable and hook; this was a new machine that has been out on rental and only worked 1676 hours.
Price: $35,750. Class "A" Warranty

1 only International model TD-24 diesel crawler tractor, serial #1056, with torque converter and equipped with cable angledozer and rear mounted towing winch with cable and hook; this was a new machine that has been out on rental and only worked 867 hours.
Price: $37,500 Class "A" Warranty

1 only Bucyrus-Erie model 22-B, serial #117472, ¾ yd. drag shovel, powered with I.H.C. UD-525 diesel engine, 12' long crawlers, 26" pads; this was a new machine that has been out on rental and only worked 1022 hours.
Price: $29,850 Class "A" Warranty

TWIN CITY INDUSTRIAL EQUIPMENT LTD.
915 Memorial Ave. P. O. Box 810
Port Arthur, Ontario

SMALL SHOVELS, CRANES, DRAGLINES — UP to 2½ YDS.

SHOVELS—DRAGS—CRANES
DRILLS—EUCLIDS

2400 Lima Dragline, 130', 5 yd.
4500 Manitowoc Drag, 120', 5 yd.
3900 & 3500 Manitowoc Cranes
111-M Marion Drag, 100', 4 yd.
1055 P&H Dragline, 100', 3½ yd.
1201 Lima Drag, 85', 3 yd.
54-B Bucyrus Erie Drag, 80', 2½ yd.
1001 Lima Drag, 85', 2½ yd.
170-B Bucyrus Erie 6½ yd. Elec. Shovel
150-B Bucyrus Erie 6 yd. Elec. Shovel
120-B Bucyrus Erie 4 yd. Elec. Shovel
1055 P&H 3½ yd. Standard Shovel
955 P&H 2½ yd. Standard Shovel
80-D Northwest 2½ yd. Standard Shovel
51-B Bucyrus Erie 2 yd. Standard Shovel
38-B Bucyrus Erie 1½ yd. Standard Shovel
#6 Northwest Backhoe
Unit 1020 ¾ yd. Shovel
Also, various smaller Shovels & Drags
Truck Cranes—Link Belt, P&H, Bay City, Lorain
400 Reich Truck Mounted Rotary Air Drill
600 Reich Heavy Truck Mounted Rotary Air Drill
750 Reich Heavy Truck Mounted Rotary Air Drill
Euclid Trucks—Rear & Bottom Dump

FRANK SWABB EQUIPMENT CO., INC.
313 Hazleton Nat'l Bank Bldg.
Hazleton, Pa. GLadstone 5-3658

1—Bucyrus-Erie H-5 Hydrocrane complete with cab, cab heater, 3-piece boom section, which permits the variable boom length range from 24' to 50'; 20' jib, 10-ton, 3-sheave hook block, 1500# counterweight. Mounted on GMC Model MW 503V tandem rear axle truck with 11,000# front axle and 3-speed reduction unit, and remote control equipped, permitting operation of truck from crane operator's position. s/n 116-120. This machine was completely new in 1957, and is in like new condition, having been used for steel erection only, less than 2,000 miles on truck. GMC truck Model MW 503V truck s/n NW503-VT 1048. F.o.b. Minneapolis, Minn.
Price $21,250

WM. H. ZIEGLER CO., INC.
2929 University Ave., S.E.
Minneapolis 14, Minn.
FRanklin 1-7971

1—Shovel attachment for a 22-B—fair condition. F.O.B. Dallas $1500
2—38-B shovel attachments—excellent condition. F.O.B. Dallas ..... $8500 ea.
1—Northwest 6 shovel, Murphy diesel, s/n 15821 good condition. F.O.B. Massena, N. Y.
Price $25,000
1—Unit KD 20-ton crane, rubber tired carrier, excellent condition. F.O.B. Messena, N. Y.
Price $14,000
1—A.C., HD-20 tractor, w/Garwood hydraulic bulldozer, Garwood winch s/n 5745, good condition. F.O.B. Dallas $8500
1—Cat. D-8 tractor with Fleco rock rake, no power unit, s/n 2U17207, good condition. F.O.B. Dallas $7000

BROWNING-FERRIS MACHINERY CO.
305 Exposition Ave. Phone TAylor 3-8121
Dallas, Texas

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

TRACTORS

1—Caterpillar D8 tractor, Serial No. 2U-7512SP, equipped with a No. 24 cable control—front mounted, and a No. 25 cable control—rear mounted, 8A angle dozer and all the guards, excellent operating condition.
Price, F.O.B. Missoula, Mont. $13,750

1—Caterpillar D8 tractor, Serial No. 2U-3052, equipped with an 8A bulldozer, No. 24 cable control, Hyster Hyspeed winch, in operating condition.
Price, F.O.B. Missoula, Mont. $7500

1—Caterpillar D8 tractor, Serial No. 2U-8729, equipped with a No. 25 rear mounted cable control and 8A angle dozer, heavy-duty operator guard, running gear 75% of new. This machine completely gone through and repaired within the last year.
Price, Kalispell, Mont. $12,000

1—Caterpillar D8 tractor, Serial No. 2U-7628, equipped with No. 24 cable control, 8A bulldozer, Hyster Hyspeed winch, operator guards, heavy-duty track roller guards, new tracks and the machine has been completely reconditioned and guaranteed.
Price, F.O.B. Missoula, Mont. ..Bonded Buy

1—Caterpillar D8 tractor, Serial No. 2U-16526, equipped with roller guards, crankcase guards, pull hook, and equipped with No. 24 cable control and 8A angle dozer.
Price, F.O.B. Missoula, Mont. ..Bonded Buy

1—Allis-Chalmers HD19 tractor, equipped with push plate.
Price, F.O.B. Missoula, Mont. $2500

1—International Harvester TD24 tractor, Serial No. TDE-4206, with Bucyrus-Erie double drum winch, Bucyrus-Erie angle dozer, and all guards, including operator guard. Cleaned and repainted—appearance very good. Planitary brakes and clutches relined, rollers replaced and repaired as necessary, front idler shafts replaced, running gear 50% good, new batteries, tractor completely checked over.
Price, F.O.B. Kalispell, Mont. $9000

1—International Harvester TD24 tractor, Serial No. TDF-5652, equipped with Caterpillar No. 25 double drum rear mounted cable control and a Caterpillar U-type bulldozer, screen type engine guards, heavy duty operator guards, crankcase guard and roller guards. This machine had a great deal of work done on it just a short time ago. The dozer has new cutting edges and end bits. The machine has been repainted and is in good operating condition.
Price, F.O.B. Missoula, Mont. $15,000

1—Allis-Chalmers HD21A tractor, Serial No. HD21A-7638. This machine is equipped with a double drum rear-mounted cable control and an angle dozer. The machine has a little over 3000 hrs. and is in good operating condition.
Price, F.O.B. Kalispell, Mont. ..Certified Buy

1—Caterpillar D7 tractor, equipped with No. 25 cable control and 7A bulldozer, Serial No. 3T-5656.
Price, F.O.B. Kalispell, Mont. $5000

1—Caterpillar D6 tractor, Serial No. 9U-2817, equipped with 6A angle dozer, No. 24 front mounted cable control, rear mounted Hyster Hyspeed skidding winch, completely rebuilt and checked over.
Price, F.O.B. Missoula, Mont. ..Bonded Buy

1—Caterpillar D4 tractor, Serial No. 7U-30543, equipped with 5-roller track frame and Caterpillar No. 44 hydraulic control, 4A angle dozer and a Hyster D4N towing winch. This machine has only 2,202 hour-meter hours since new, starting engine, belt-hand final drive overhauled, grousers have been built up and the pins and bushings turned.
Price, F.O.B. Missoula, Mont. ..Certified Buy

1—Caterpillar D4 tractor, Serial No. 4U-4020, equipped with crankcase guard, radiator and track roller guards, Holt hydraulic angle dozer and LeTourneau single drum skidding winch, 16" tracks, 50% good, heavy-duty fenders, operator guard.
Price, F.O.B. Kalispell, Mont. $3250

1—Caterpillar D4 tractor, Serial 7U 22574, equipped with roller guards, crankcase guard, operator guard, 2800 actual hourmeter hours, Caterpillar No. 44 hydraulic control, Caterpillar 4A angle dozer, Hyster winch, excellent operating condition, cleaned up, repainted and completely checked over.
Price, F.O.B. Missoula, Mont. ..Certified Buy

1—International Harvester TD9 tractor, Serial No. TDCB-30112T7BM wide gauge, with Bucyrus-Erie angledozer and Carco towing winch, needs work—rough.
Price, F.O.B. Kalispell, Mont. $1500

1—Caterpillar No. 933 Traxcavator shovel, Serial No. 11A-704, less than 500 actual hours since new, track roller guards, crankcase guard, standard bucket—1 yd.—with teeth, "like-new" condition.
Price F.O.B. Missoula, Mont. ..Bonded Buy.

Bonded Buys are backed with 90 day guarantee and certified bond. Certified Buys are backed with a 30 day written guarantee.

CRAWLER TRACTOR ATTACHMENTS

1—Caterpillar No. 25 cable control, Serial No. 9D-29214. This unit is equipped for mounting on a D7 or D8, used a very short time since new, completely checked over. Bonded Buy.
Price, F.O.B. Missoula, Mont. $1500

1—Caterpillar No. 30 cable control, Serial No. 84C-186, completely overhauled.
Price, F.O.B. Missoula, Mont. $1000

1—Caterpillar No. 30 front mounted cable control, Serial No. 54C-103, completely overhauled, guaranteed in new condition.
Priced, F.O.B. Missoula, Mont. $1000

1—Caterpillar No. 24 cable control, in good repaired condition.
Price, F.O.B. Kalispell, Mont. $750

1—Hyster D7N towing winch, Serial No. 81101, fully guaranteed and in excellent operating condition.
Price, F.O.B. Missoula, Mont. $1750

1—Lufkin D8 towing winch, worm gear-driven, good condition.
Price, F.O.B. Missoula, Mont. $2000

1—Hyster D8D towing winch, Serial No. 106639, equipped with an automatic brake, excellent operating condition, fully guaranteed.
Price, F.O.B. Missoula, Mont. $2072

1—Arrow dozer for D8 tractor, with C-frame, side arms and cutting edges, good general condition.
Price, F.O.B. Kalispell, Mont. $500

1—Hyster Hystaway for D8 tractor, completely reconditioned and in excellent condition, complete less front end equipment, 30-day guarantee.
Price, F.O.B. Missoula, Mont. $3000

USED ROAD MACHINERY

1—Caterpillar No. 40 scraper, 4½ cu. yd. capacity. This unit is in excellent condition and has been used very little. Certified Buy.
Price, F.O.B. Missoula, Mont. $2500

1—Caterpillar No. 70 scraper, equipped with 16.00 x 24—24-ply tires on the front, 18.00 x 24—20-ply tires on the rear; the tires average 50% good. This unit has been completely checked over and seals and bearings have been replaced where necessary. Capacity 13 cu. yd. struck, 15 cu. yd. heaped, side-boarded.
Price, F.O.B. Missoula, Mont. $5500

1—Caterpillar No. 12 motor grader, Serial No. 8T-4572, with cab heater, wiper, lights, 12 ft. blade, 13.00 x 24 tires on all wheels, average 50% good. Good operating condition and appearance.
Price, F.O.B. Kalispell, Mont. $7750

1—Caterpillar No. 12 motor grader, Serial No. 8T-1548, completely reconditioned, new boosted power-steering, recapped tires, 12 ft. blade, scarifier and cab heater. This machine is in excellent operating condition. New machine guarantee.
Price, F.O.B. Missoula, Mont. $12,000

1—RH3 Wooldridge ripper with two teeth, good operating condition. As is.
Price, F.O.B. Missoula, Mont. $750

1—Grade-More slope grader attachment for Caterpillar No. 12 motor grader, used one month.
Price, F.O.B. Missoula, Mont. $1200

USED POWER UNITS AND ELECTRIC SETS

1—Caterpillar D13000 power unit, Serial No. 4F-8119, outboard bearing—22 in. x 10½ in. base, cast iron flat pulley on outer bearing—18-in. x 12-in. base, cast-iron flat pulley on inner bearing, good operating condition.
Price, F.O.B. Kalispell, Mont. $2000

1—Caterpillar D13000 electric set, Serial No. 4S-5616, General Electric 93.8 KVA, 75 kw, 440 volt, 3-phase, 60-cycle, reconditioned, guaranteed.
Price, F.O.B. Missoula, Mont. $6500

1—GMC 671 diesel power unit, mounted on steel base with base contained fuel tank, equipped with 16 groove V-belt pulley, operating condition.
Price, F.O.B. Missoula, Mont. $2000

1—GMC 6-110 engine, used about 2,000 hours, 275 hp, mounted on steel and wood skids, has 10 groove pulley, no outboard bearings.
Price, F.O.B. Kalispell, Mont. $800

1—32-volt Kohler, Model E36A DC lightplant, No. 132394, 1.5 kw, 40 volts DC, 32-volt batteries—38 amp. per terminal, 1,000-rpm, charging controller, excellent condition.
Price, F.O.B. Kalispell, Mont. $150

USED SHOVELS

1—Lima ¾-yd. crane, mounted on Maxi unit, equipped with Baer heel boom, good operating condition.
Price, F.O.B. Missoula, Mont. $15,500

1—Bucyrus-Erie 15-B dragline, Serial No. 57761, track mounted, ½-yd. rated capacity dragline with 35' boom and ¾-yd. dragline bucket; powered with Buda Model 6DT-317 diesel engine, Serial No. 15653, with direct electric starting. Machine seems to be in fair running condition, but tracks need rebuilding and unit is being checked over at this time. As is.
Price, F.O.B. Missoula, Mont. $5500

1—Bucyrus-Erie 44-B dragline-shovel combination, equipped with a Kohler light plant and lights, powered with a Buda diesel engine. This machine appears to be in fair running condition and is being checked over at this time in our Missoula store .....Contact for price

1—Model H Wagner Scoopmobile, used very little, good operating condition, ¾-yd.
Price, F.O.B. Missoula, Mont. $5000

1—Hough Payloader, ¾-yd. capacity, good condition, 30-day guarantee.
Price, F.O.B. Missoula, Mont. $3500

USED COMPRESSORS AND HAMMERS

1—Ingersoll-Rand 315 Gyro-Flo rotary air compressor, powered with a GMC diesel engine, has the appearance of a new machine and is in excellent operating condition. Half the price of a new machine.
Price, F.O.B. Missoula, Mont. ..Certified Buy

1—Gardner-Denver Model 105 air compressor, mounted on 4 rubber tires, in good operating condition, new governor, motor overhauled.
Price, F.O.B. Missoula, Mont. $1500

1—Worthington jackhammer, Model WS 55. As is.
Price, F.O.B. Missoula, Mont. $75

1—Gardner-Denver Model UMB drill wagon, with Gardner Denver DB9D 3½" hammer, Serial No. 177635, 4-ft. power feed. Chuck for 1¼" round lug-shank steel.
Price, F.O.B. Missoula, Mont. $1200

1—Gardner-Denver air compressor, 105, Serial No. 163604, trailer mounted with Hercules gas engine, completely checked over and in good operating condition.
Price, F.O.B. Missoula, Mont. $1500

1—Gardner-Denver 105 air compressor, Serial No. 111379, completely overhauled, excellent condition, mounted on rubber, 30-day guarantee.
Price, F.O.B. Kalispell, Mont. $2000

1—Gardner-Denver 125 air compressor, Serial No. 190218, portable, very good operating condition, powered with Hercules OXD-5 engine, Serial 2875652. Used about 60-days, since completely overhauled.
Price, F.O.B. Missoula, Mont. $2750

1—Gardner-Denver S48 hammer, Serial No. 160-655, good operating condition. As is.
Price, F.O.B. Missoula, Mont. $200

1—Gardner-Denver S48 hammer, Serial No. 215-372, new guarantee.
Price, F.O.B. Kalispell, Mont. $425

USED MACHINERY—MISCELLANEOUS

1—Model 72 Mall electric saw, Serial No. 39334, with 27" circular blade, metal carrying case, good operating condition and appearance. As is.
Price, F.O.B. Kalispell, Mont. $100

1—Homelite Model S-20 power saw, Serial No. 862100, good operating condition, includes 12" blade. As is.
Price, F.O.B., Kalispell, Mont. $100

1—Homelite Model S-17 power saw, Serial No. 442342, good operating condition, includes 17" cutter bar. As is.
Price, F.O.B. Kalispell, Mont. $75

1—Wagner DL16 forklift, 16,000 lb. capacity, good operating condition, 30-day guarantee.
Price, F.O.B. Missoula, Mont. $6000

1—American double drum hoist, with a transmission and Ford V-8 Ford engine. As is.
Price, F.O.B. Missoula, Mont. $350

1—Large steel water tank.
10' diameter
12' height
15' gauge
7,000 gal. capacity
made new in 1956, used only 6 months, sold new for $6,39
Price, F.O.B. Missoula, Mont. $400

1—Pioneer Model 60 crushing & screening plant.
9" x 16" jaw crusher
2' x 5' apron single-deck screen
40' x 16" feeder conveyor, with hopper and clutch
20 HP 220-volt, 3-phase electric motor
73' x 16" delivery conveyor
20' x 16" return conveyor.
Price, complete, F.O.B. Kalispell, Mont. $3250
Price, 9 x 16 crusher only $2250

1—Pitcher gold washer with Trommel Screen, powered by Continental engine. Contact Missoula Office for Price.

WESTMONT TRACTOR CO.
150 E. Spruce P. O. Box 1445
Missoula, Mont.

New TL 20 Lorain shovel front .....$ 650
54-B shovel front complete. New $4750

VALLEY EQUIPMENT CO.
620 Seventh St. Salem, Ore.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Caterpillar Model D-8 diesel tractor, serial 13A 2868, equipped with oil clutch, electric lighting system, electric starter, crankcase guard, track roller guards, new 22" tracks, Caterpillar Model No. 25 cable control and Caterpillar Model No. 8-S bulldozer with set of four Preco Back-Rip Scarifiers. Complete machine in very good condition. $19,500

Caterpillar Model D-8 diesel tractor, serial 1H 6135SP, equipped with LeTourneau Model R-8 rear double drum cable control. Fair condition. Price $2100

Caterpillar Model D-7 diesel tractor, serial 17A 4240, equipped with oil clutch, electric lighting system, electric starter, crankcase guard, Caterpillar Model No. 25 cable control and Caterpillar Model No. 7-S bulldozer, very good condition. $14,950

International Model TD-18 diesel tractor, serial TDR 5299T4N, equipped with crankcase guard, electric starting system, Buckeye rear double drum cable control and Buckeye straight blade cable bulldozer. Needs miscellaneous minor repairs to put in good running condition. $1700

Southwest Model S-90 cable scraper, 8.5 cu. yds. struck capacity, 11 cu. yds. heaped capacity, equipped with 14.00 x 20 single tires front and rear. Very good condition. $3000

LeTourneau Model M cable scraper, 6 cu. yds. struck capacity, 8 cu. yds. heaped capacity, equipped with 10.00 x 20 tires, single front, dual rear. Good condition $2500

Bucyrus-Erie Model 54-B combination shovel & crane, serial 77778, equipped with shovel front with 26' boom, 18' handle, 2½ cu. yd. dipper, 100' crane boom, 20' jib, high gantry, running boards, counterweight, 30" standard flat pads, fairleads for dragline, and powered by Buda Model 6 DC-1879 diesel engine with gasoline starting engine and electric starter. Located at Gallup, New Mexico. Very good condition. Price $52,500

Pioneer Model 38-V portable crushing & screening plant, serial 38-29, equipped with 10" x 36" jaw crusher, 30" x 18" roll crusher, 3' x 10' three deck inclined vibrating screen, all mounted on steel truck frame with 10.00 x 20 tandem axle dual rear tires, front dolly with towing tongue and 10.00 x 20 dual tires. Plant also equipped with 18" x 20' waste conveyor, 24" x 50' portable lattice frame feed conveyor with two 7.50 x 20 pneumatic tires, 24" x 50' portable lattice frame delivery conveyor with two 7.50 x 20 pneumatic tires, 18 cu. yd. Jack-Leg steel bin, and powered by Caterpillar Model D-13000 diesel engine with flat belt drive. Complete plant is in good condition. Located at Clovis, New Mexico. $20,000

Barber-Greene Model 840 portable hot mix asphalt plant, serial 840-48-23, complete with mixer, cold elevator, feeder, hopper, front dolly and LeRoi 4 cyl. water cooled gasoline engine; Barber-Greene Model 830 aggregate dryer complete with burner, dust collector, discharge chute, feeder and LeRoi 4 cyl. water cooled gasoline engine; Cleaver-Brooks "Dence" combination tank car heater and oil pumping booster, powered by Waukesha 4 cyl. water cooled gasoline engine and mounted on steel skid base; Burch Model B-100 10' wide asphalt spreader box on pneumatic tired wheels and Buffalo-Springfield 6-8 ton tandem road roller with spray bars, wheel scrapers, and powered by 4 cyl. water cooled gasoline engine. Complete plant and all components in good working condition. Located at Gallup, New Mexico. Price $20,750

R. L. HARRISON CO., INC.
1801 4th St., N.W. — P. O. Box 1320
Albuquerque, N. M. — Phone: Chapel 7-8811

Model 22-B Bucyrus-Erie shovel #69185, with GMC diesel engine, located in Seattle.
38-B Bucyrus-Erie 1½ cu. yd. shovel #85914 with Caterpillar diesel engine, 33" wide treads, located near Seattle.
Model 25 Northwest diesel shovel, long tracks, Murphy engine, 2-speed travel, located near Seattle.
Model 25 Northwest diesel shovel, and pull shovel, GMC diesel engine; located in Seattle.
54-B Bucyrus-Erie 2½ cu. yd. shovel with Cummins diesel engine and torque convertor, 36" wide treads. Serial #118053. Machine like new. Used under 900 hours.
Three Type "C" LeTourneau-Westinghouse Roadster with E-18 Tournarocker.

CLYDE EQUIPMENT CO.
3410 First Ave. S. — Seattle 4, Wash.

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

CRAWLER SHOVELS

Bucyrus-Erie 38-B shovel, 20' 5" dipper stick, 1¼ cu. yd. dipper, powered by International diesel engine. Present condition $28,000
If rebuilt $36,000

Lima Model 802, 2 yd. shovel with 36" pads, air controls, powered by a Cat D17000 diesel engine, with electric starter. Thoroughly rebuilt. Ask for detailed list of replacement parts, as installed.
Guaranteed $38,500

Lorain Model L820, 2 yd. combination crane, clamshell and dragline, 50' boom, rudomatic tagline and fairlead, 35" pads, Waukesha diesel engine.
Rebuilt $32,000

Bucyrus-Erie Model 15-B hoe, ¾ yd., powered by a Waukesha Model HP526 gasoline engine with electric starter.
Good condition $7000

P & H Model 255A backhoe, ¾ yd. 26" tracks, diesel engine.
Reconditioned $16,500

TRUCK CRANES

Lima Paymaster truck crane, type E34, ¾ yd. 35' boom, powered by 6-cyl. Buda gas engine; mounted on Brockway 6 x 6 truck carrier with ten 12.00 x 24 tires.
Reconditioned $13,000

TRACTORS

Caterpillar D4 diesel tractor, 60" gauge, 16" tracks, with Cat 4S straight hydraulic bulldozer and No. 44 hydraulic control.
Bonded Buy $7500

Allis-Chalmers HD20W diesel tractor w/ Garwood bulldozer and DD P.C.U. Completely rebuilt.
Price $19,500

Caterpillar D8 diesel tractor, with Hi-Output engine, Cat 8S bulldozer and No. 46 hydr. control. Reconditioned—30 day guarantee.
Certified Buy $16,500

TRENCHER

Cleveland No. 95 Trencher, option 5, 16" buckets, 21½" cut, powered by Buda gasoline engine.
Good value $3500

H. O. PENN MACHINERY CO., INC.
140th St. & East River
New York 54, N. Y.
Phone: CYpress 2-4800

Allis-Chalmers HD11G, s/n 442 (1955). This machine in excellent condition throughout. F.O.B. Casper, Wyo. $15,000

Buckeye ditcher model 160, s/n 16097, 30" buckets, less than 1,000 hours on this machine. F.O.B. Denver, Colo. $17,500

Lorain L80J, 1¼ yd. shovel, s/n 23550, with Cat. 337 engine, fluid coupling and air control. Entire unit in very good condition with very low hours. F.O.B. Denver, Colo. $36,500

Wooldridge model TC-170, 17 yd. scraper, mounted on four 27.00 x 24 tires—very good machine. F.O.B. Denver, Colo. $3950

THE COLORADO BUILDERS' SUPPLY CO.
W. Evans & S. Mariposa Sts.
Phone WE 5-3571
Denver, Colorado

1—Koehring Model 303 dragshovel, ¾ yd. with Waukesha gas engine, standard crawlers, serial #2537. Good condition.
1—Bucyrus-Erie 15-B combination ½ yd. dragshovel, shovel, clamshell, dragline. Buda 6-cyl. inder gasoline engine, electric starter, 20" cats, running boards, serial #91570. Exceptionally clean shape.
1—Bucyrus-Erie 15-B combination ½ yd. shovel and 40' clamshell with 16" cats. Buda gas engine, electric starter, spare rebuilt block. Fair shape, needs work. Serial #45770. Price $3500.
1—Koehring Model 304 extra heavy combination dragshovel, clamshell, dragline, 60' boom. Cat diesel power, maximum counterweight, oversize crawlers, power load lowering. Perfect condition.
1—Lima ¾ yd. Paymaster, dragshovel, 35' crane clamshell boom, shovel front, GM 371 diesel power, 22" cats. 10 years old. Excellent condition.

S. M. CHRISTHILF & SON, INC.
Timonium Road and Harrisburg Expressway
Timonium, Maryland — VAlley 5-5100

Loram Model TL-20 ½-yd., on crawlers, with 40' boom, shovel front and diesel engine. 1079. As is ..... F.o.b. Louisville, Ky. $5500.

"Quick-Way" Model L, ½ yd. with 40' boom. Shovel mounted on White half track. 961. As is. F.o.b. Louisville, Ky. $5500

Schield Bantam with 40' boom and hack hoe, mounted on White half track. 5712. As is. F.o.b. Louisville, Ky. $3500

SMALL SHOVELS, CRANES, DRAGLINES — UP TO 2½ YDS.

Koehring Model 3-4, ¾ yd. backhoe on crawlers, with diesel engine. 5715. As is F.o.b. Evansville, Ind. $10,500

Bucyrus-Erie Model 38-B 1½ cu. yd. Positive crowd shovel. Powered by International Mdl. UD-24 diesel engine. 21' boom, 16'2" dipper handle, 20" power down hoist drum lagging. 1½ cu. yd. bucket. 27" tread. Weight 105,000#. Shovel has been stripped down and completely rebuilt from ground up, including engine. First class condition and guaranteed.
$42,000 F.o.b. Elizabethtown, Ky., loaded on car. Subject to prior sale. Replacement cost approximately $60,500.

BRANDEIS MACHINERY & SUPPLY CO.
P. O. Box 1705 — Louisville 1, Ky.
Jim Waddell — MElrose 7-4741

MISCELLANEOUS EQUIPMENT

ONE—2¼ YD. COAL LOADING DIPPER, NEW FOR 38-B. LOCATED NEAR PITTSBURGH. $2500.
BOX 3720

Model 27-T blast hole drill, serial No. 18269, Waukesha gasoline power, crawler-mounted, 33' one-piece all-steel derrick complete with tools in good working order. Located in Missouri. Priced to sell. Box 3718

Model 27-T blast hole drill, serial No. 19628, Waukesha gasoline power, crawler-mounted, 33' one-piece all-steel derrick complete with tools in good working order. Located in Missouri. Priced to sell. Box 3719

For Sale: Two shovel attachments complete with 1½ cu. yd. dippers for Bucyrus-Erie Model 38-B. Used approximately 500 hours. Located in Virginia. Price f.o.b. cars each $8500.
For further information write:
BROWNING-FERRIS MACHINERY CO.
P. O. Box 7966 — Dallas, Texas

Shovel attachment for 54-B Bucyrus-Erie.
Backhoe attachment for 22-B Bucyrus-Erie.
Shovel attachment for 15-B Bucyrus-Erie.
Shovel attachment for 10-B Bucyrus-Erie.
Backhoe attachment for L Insley.

POWER SHOVEL CO.
1600 West McCarty St. — Phone: ME 9-1321
Indianapolis 21, Indiana

FOR SALE: Euclid loader, Model 10BV, serial No. 10BV188, powered by Cummins Model NHBIS, Serial No. 106832. Located vicinity Chicago, Ill.

O'Neil-Winkelman Co.
2751 Clybourn Ave. — Chicago, Ill.
EAstgate 7-1611

Shovel attachment complete $140; good condition. Bucyrus-Erie 10-B backfill blade, $25; 5 bucket teeth, $25; tandem assembly for truck, $100.

McCANDLESS CONSTRUCTION CO.
1625 Kearney St., — Springfield, Missouri
Phone: 6-0995

1 Unit 45 tagline reel complete with fittings, hose and guard for H-3 Hydrocrane. Good condition. Price f.o.b. Minneapolis, Minn., $150. Write or call Jim Perkins, Wm. H. Ziegler Co., 2929 University Ave., S.E., Minneapolis 14, Minn. Phone: FRanklin 1-7971.

RENT STEEL SHEET PILING
Get the exact lengths and sections you need of all standard sections, delivered *on time*—and at Foster's usual low rental rates.
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L.B. FOSTER CO.
PITTSBURGH 30 • NEW YORK 7 • CHICAGO 4
ATLANTA 8 • HOUSTON 2 • LOS ANGELES 5

MISCELLANEOUS EQUIPMENT

1—¾ yd. hydraulic clamshell bucket with 5 bottom teeth and 4 sidecutters, for H-2 Hydrocrane. Price: $200 f.o.b. Cleveland, Ohio.

1—New sprag for H-3 Hydrocrane removed from Hydrohoe #93098. Price $50 f.o.b. Cleveland, Ohio. Write: The W. T. Walsh Equipment Co., 12750 Berea Rd., Cleveland 11, Ohio.

Schield Bantam model T-35 s/n 5487, mounted on White diesel 6 x 4. Dragline and backhoe fronts. F.O.B. Regina $4300

Hop-To self-powered trailer type digger, has both backhoe and loading buckets, hydraulic stabilizers. New hydraulic pump. 1954 model. F.O.B. Saskatoon $3450

Allis-Chalmers model HD-10 s/n W-7638 with Garwood hydraulic angle dozer s/n 851-87, in operating condition. F.O.B. Regina $4000

Bros double-drum tamping roller, 48" drums, 128" per drum. F.O.B. Regina $1000

Bucyrus-Erie model CR-5 cable controlled ripper. Two new shanks and points with unit. F.O.B. Regina $1500

R. J. FYFE EQUIPMENT LIMITED
1148-50 Osler St. Phone: JO 9-3804
Regina, Saskatoon

FORD MODEL JD-1025 GASOLINE ENGINE with radiator-flywheel, ring gear and starter. $200.

***ALL PRICES—**
F.O.B. SOUTH MILWAUKEE, WISCONSIN
BUCYRUS-ERIE COMPANY
South Milwaukee, Wis.

HELP WANTED

Superintendent wanted in South-Western Ontario. Should have basic mining or mechanical engineering education or equivalent in actual experience in the operation of open pit limestone or similar type quarry. Should have intimate knowledge of extraction and processing of limestone to multi-size aggregates and be able to operate at a cost figure that would keep the company on better than equal footing in a highly competitive market. Ability to handle personnel also required. Salary to be commensurate with ability and experience. Box 3731.

STANDS UP TO SEVERE USE

and even abuse

One word describes a Hayward — *ruggedness.* Yes, it's as tough, strong, sturdy as a bucket can be — and even more so. Extreme simplicity, little if any upkeep, high operating efficiency! Details on request. Write! THE HAYWARD COMPANY, 50 Church St., New York 7, N.Y.

HAYWARD BUCKETS

CLAM SHELL • ELECTRIC • ORANGE PEEL • GRAPPLES
famous for performance since 1888

Notes from the Manufacturers

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced plans for new engineering, development and research laboratories in Greendale, a Milwaukee suburb. The new facilities will be housed in a one-story masonry, glass and steel panel building to be erected on a 30-acre site. A staff of 150 to 200 scientists, engineers, draftsmen, technicians and administrative personnel will be employed at the facility.

Atlas Copco Pacific, Inc., San Carlos, Calif., has announced the opening of an equipment sales office in Seattle, Wash. It will be directed by David O. Day, who since 1951 has been a member of Atlas Copco Pacific's district office at Spokane, Wash. Day will cover western Washington and the Portland (Ore.) area.

Baldwin-Lima-Hamilton Corp., Lima, Ohio, has appointed J. W. (Jack) Hardesty general sales manager of its construction equipment division. Other promotions include Howard W. Read, parts and service manager, and William Lutes, parts sales manager.

Blaw-Knox Co., Pittsburgh 22, Pa., has named J. P. Cullen manager of clamshell bucket sales. He succeeds Arnold Hooper, who recently retired. Joining Blaw-Knox in 1938, Cullen became eastern manager of clamshell bucket sales with headquarters in New York, N. Y. He held this position for 13 years, servicing New York and Philadelphia (Pa.) areas. Since 1951, he has been sales manager of all Blaw-Knox equipment on the West Coast, with offices in San Francisco, Calif.

Bucyrus-Erie Co., South Milwaukee, Wis., has announced the retirement of Herbert W. Thornburg, 67, consulting engineer—drills, who had been with the firm 35 years. Thornburg joined the firm in 1922 as a draftsman. When Bucyrus-Erie purchased the drill manufacturing business of the Armstrong Drill Co., Waterloo, Iowa, in 1933, Thornburg was appointed engineer in charge of drills. He later became chief engineer—drills. Thornburg was one of the principals in expanding the line of churn-type water well and blast hole drills acquired from Armstrong. He also helped develop larger diameter blast hole drills to fulfill demands from this field. Before coming to Bucyrus-Erie, Thornburg served with the United States Geological Survey and the U. S. Corps of Engineers.

Caterpillar Tractor Co., Peoria, Ill., is sponsoring a series of intensive business seminars during 1958 to more fully acquaint small contractors with sound business practices. Subjects to be covered will include machinery owning and operating costs, machine operation and application, production comparisons, service, parts, advertising and job opportunities. The seminars are aimed at counteracting the major causes of contractor failure. Management practices including business records, owning and operating costs and bidding methods will all be discussed. The business seminars are to be conducted in half-day sessions at Caterpillar dealerships throughout the country.

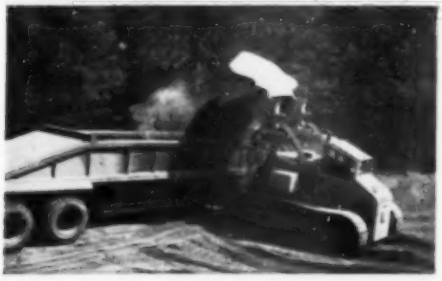
Harnischfeger Corp., Milwaukee, Wis., has acquired the designs of General Electric Co. for rotating type welding machines using both gas drives and electric motors. General Electric ended production of these machines last July. The gas-driven rotating type welders are widely used in the heavy construction and pipeline industries for on-the-job welding.

LeTourneau-Westinghouse Co., Peoria, Ill., has appointed Construction Service Equipment Co., 21st & Pacific sts., Omaha, Neb., distributor for its line of earthmoving, hauling and grading equipment in the state of Nebraska and three bordering counties in Iowa. In addition to headquarters in Omaha, the new distributor operates a branch in North Platte, Neb. Complete service, parts and shop facilities are provided at both locations.

EIMCO 105 FRONT END SHOVEL

EIMCO 105 TRACTOR-DOZER

EIMCO 105 TRACTOR-EXCAVATOR (OVERHEAD)



"HELL FOR STOUT"

This phrase — customers (the world over) have learned from experience — is the most accurate way to describe the design and construction of Eimco Equipment.

For over three-quarters of a century Eimco has built machines for the rock loading and earth moving industries that are offered to do the tough, hard jobs. You can get a lot more for your money when you buy the Eimco Tractor-Dozer, or the Eimco Tractor-Front End Shovel, or the Eimco Tractor-Excavator (Overhead).

These are tractors that are built to do the job for which they were sold — they are not like all competitive machines — adaptations of agricultural or industrial machines.

Check these exclusive features that you get ONLY when you buy an Eimco:

1. Full visibility — operator sits up-front.
2. Fast maneuverability — independent track control — power shift.
3. Low center of gravity — climbs 100% grades.
4. Torque converter — elimination of master clutch, gear shifting and levers.
5. Unitized construction — fast, easy maintenance.

Why settle for less—demand the best for your equipment dollars.

THE EIMCO CORPORATION

Salt Lake City, Utah—U.S.A. • Export Offices: Eimco Bldg., 52 South St., New York City

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Cleveland, Ohio Houston, Tex. London, England Gateshead, England Paris, France Milan, Italy Johannesburg, South Africa

B-315

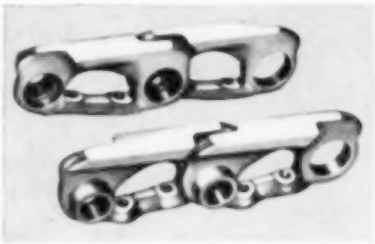
PRETESTING STEEL IS ONE WAY MATCHLESS QUALITY IS ASSURED IN GENUINE CATERPILLAR PARTS

Careful selection of material gives greater strength to new D8 strutless track links

Quality doesn't just happen. The world-famous quality that is the hallmark of Caterpillar earthmoving equipment is a direct result of never-ending research, the finest possible materials, and persistent attention to every manufacturing detail. This is true of Caterpillar machines. And it is true of Caterpillar parts.

The new, strutless link for Cat D8 Diesel Tractors is an example of this emphasis on quality. Each link is able to bear the entire weight of the tractor, over and over again, in the roughest of terrains and climates. This is how Caterpillar makes sure these links meet this challenge:

All steel used for links is given an extensive series of tests *before* manufacture. In the Caterpillar Metallurgical Laboratory it is first analyzed for chemical composition by a spectrograph—slight variances in chemical make-up can result in big differences in the finished product. Then the steel is tested for hardenability; in other words, the degree to which it will respond to heat treating. Resistance to impact loads is measured to insure the track link will give maximum performance under all conditions. Steel that cannot be made into Caterpillar quality links is rejected.



New, strutless link for Caterpillar D8 Diesel Tractors.

The new D8 link is forged—the best way to make a link. Forgings are more dense. They have "inner flow lines"—the equivalent of grain in wood—following the contour of the part, providing greater strength at critical locations as well as resistance to breakage.

"Dubbed-off" link ends eliminate damage to rollers and mating links. Strategic designing of steel into the bushing boss and arch improves fatigue strength. Links are *double* heat treated, furnace heated for a tough core, and "Hi-Electro" hardened for a deep, superhard rail surface.

Features like these mean one thing. A Caterpillar part is your best buy. Your Caterpillar Dealer has full information on the new D8 strutless links and the other quality Cat parts. See him today.

Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

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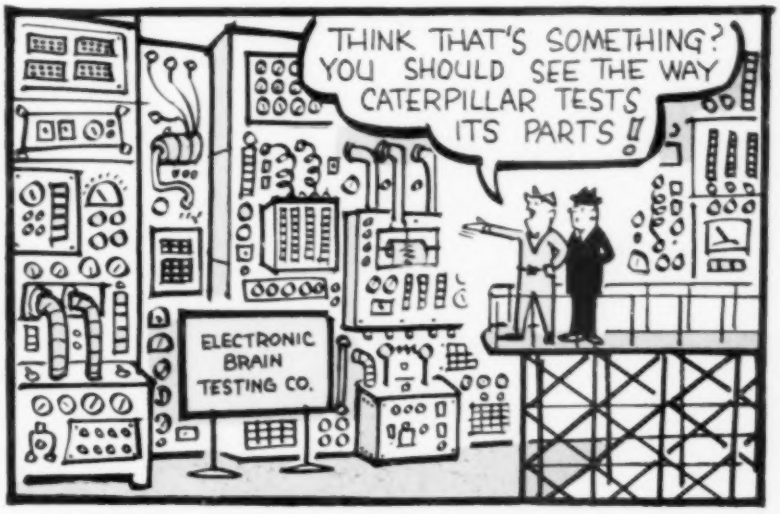
SERVICE TIP

For maximum life, tracks should have 1½" to 2" of slack. Your Operation and Maintenance Instructions have complete adjustment details.

LINK STRENGTH is measured on this hydraulic press. The design of Caterpillar track parts is under constant examination by the most extensive research facilities in the industry.